IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF KANSAS

UNITED STATES OF AMERICA
Plaintiff,
v.

E.I. du Pont de Nemours and Company

NL Industries, Inc.

Sunoco, Inc.

Defendants.

CIVIL ACTION NO. _____

REMEDIAL DESIGN AND REMEDIAL ACTION CONSENT DECREE
CHEROKEE COUNTY SUPERFUND SITE
OPERABLE UNIT 06, WACO SUBSITE
JASPER COUNTY SUPERFUND SITE
WACO DESIGNATED AREA AND WACO TRIBUTARY

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I. BACKGROUND

A. The United States of America ("United States"), on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), filed a complaint in this matter pursuant to Sections 106 and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9606, 9607.

B. The United States in its complaint seeks, inter alia: (1) reimbursement of costs incurred by EPA and the Department of Justice for response actions at the Waco Subsite of Operable Unit 6 of the Cherokee County, Kansas Superfund Site in Cherokee County, Kansas (Waco Kansas Site), and the Waco Designated Area and Waco Tributary of the Jasper County, Missouri Superfund Site in Jasper County, Missouri (Waco Missouri Site), together with accrued interest; and (2) performance of studies and response work by the defendants at the Waco Missouri Site and Waco Kansas Site consistent with the National Contingency Plan, 40 C.F.R. Part 300 (as amended) ("NCP").

C. In accordance with the NCP and Section 121(f)(1)(F) of CERCLA, 42 U.S.C. § 9621(f)(1)(F), EPA notified the State of Kansas in June, 2005, and the State of Missouri in June, 2006, of negotiations with potentially responsible parties regarding the implementation of the remedial design and remedial action for the Waco Missouri Site and Waco Kansas Site, and EPA has provided Kansas and Missouri with an opportunity to participate in such negotiations and be a party to this Consent Decree.

D. In accordance with Section 122(j)(1) of CERCLA, 42 U.S.C. § 9622(j)(1), EPA notified the United States Department of Interior, Fish and Wildlife Service, in July, 2005, of negotiations with potentially responsible parties regarding the release of hazardous substances

that may have resulted in injury to the natural resources under Federal trusteeship and encouraged the trustee to participate in the negotiation of this Consent Decree.

E. The defendants that have entered into this Consent Decree ("Settling Defendants") do not admit any liability to the Plaintiff arising out of the transactions or occurrences alleged in the complaint, nor do they acknowledge that the release or threatened release of hazardous substance(s) at or from the Waco Kansas Site or the Waco Missouri Site constitutes an imminent or substantial endangerment to the public health or welfare or the environment.

F. Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the greater Cherokee County, Kansas Superfund Site, of which Operable Unit 06 and specifically the Waco Subsite is a component, on the National Priorities List, set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on September 8, 1983, 48 Fed. Reg. 40658. Also, Pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the greater Jasper County, Missouri Superfund Site, of which the Waco Designated Area and Waco Tributary is a component, on the National Priorities List, set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on August 30, 1990, 55 Fed. Reg. 35502.

G. In response to a release or a substantial threat of a release of a hazardous substance(s) at or from OU-6 of the Cherokee County, Kansas Superfund Site, the Settling Defendants and Cyprus Amax Minerals Company, commenced on September 30, 1998, a Focused Remedial Investigation/Presumptive Remedy Feasibility Study ("RI/FS") for the Cherokee County Superfund Site pursuant to 40 C.F.R. § 300.430. Also, in response to a release or a substantial threat of a release of a hazardous substance(s) at or from the Waco Designated

Area and Waco Tributary of the Jasper County, Missouri Superfund Site, EPA commenced in 1991, a Remedial Investigation/ Feasibility Study ("RI/FS") for the Jasper County Superfund Site pursuant to 40 C.F.R. § 300.430.

H. The Settling Defendants E.I. du Pont de Nemours and Company; NL Industries, Inc.; and Sunoco, Inc.; and also Cyprus Amax Minerals Company; completed the RI/FS for the Cherokee County, Kansas Waco Subsite on January 5, 2004. The Settling Defendants Sunoco, Inc. and NL Industries, Inc., completed the RI/FS for the Jasper County, Missouri Waco Designated Area and Waco Tributary in 2003.

I. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the FS and of the proposed plan for the Cherokee County, Kansas Waco Subsite remedial action on June 22, 2004, in a major local newspaper of general circulation. EPA provided an opportunity for written and oral comments from the public on the proposed plan for remedial action. A copy of the transcript of the public meeting is available to the public as part of the administrative record upon which the Regional Administrator based the selection of the response action. Also, pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, EPA published notice of the completion of the FS and of the proposed plan for the Jasper County, Missouri Waco Designated Area and Waco Tributary remedial action on July 19, 2004, in a major local newspaper of general circulation. EPA provided an opportunity for written and oral comments from the public on the proposed plan for remedial action. A copy of the transcript of the public meeting is available to the public as part of the administrative record upon which the Regional Administrator based the selection of the response action.

J. The decision by EPA on the remedial action to be implemented at the Cherokee County, Kansas Waco Subsite is embodied in a final Record of Decision ("ROD"), executed on September 30, 2004, on which the State of Kansas has given its concurrence. The ROD includes a responsiveness summary to the public comments. Notice of the final plan was published in accordance with Section 117(b) of CERCLA. Also, the decision by EPA on the remedial action to be implemented at the Jasper County, Missouri Waco Designated Area and Waco Tributary is embodied in a final Record of Decision ("ROD"), executed on September 30, 2004, on which the State of Missouri has given its concurrence. The ROD includes a responsiveness summary to the public comments. Notice of the final plan was published in accordance with Section 117(b) of CERCLA.

K. Based on the information presently available to EPA and the States, EPA and the States believe that the Work will be properly and promptly conducted by the Settling Defendants if conducted in accordance with the requirements of this Consent Decree and its appendices.

L. Solely for the purposes of Section 113(j) of CERCLA, the Remedial Action selected by the RODs and the Work to be performed by the Settling Defendants shall constitute a response action taken or ordered by the President.

M. The Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith and implementation of this Consent Decree will expedite the cleanup of the Waco Kansas Site and the Waco Missouri Site and will avoid prolonged and complicated litigation between the Parties, and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, it is hereby Ordered, Adjudged, and Decreed:

II. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1345, and 42 U.S.C. §§ 9606, 9607, and 9613(b). This Court also has personal jurisdiction over the Settling Defendants. Solely for the purposes of this Consent Decree and the underlying complaint, Settling Defendants waive all objections and defenses that they may have to jurisdiction of the Court or to venue in this District. Settling Defendants shall not challenge the terms of this Consent Decree or this Court's jurisdiction to enter and enforce this Consent Decree.

III. PARTIES BOUND

2. This Consent Decree applies to and is binding upon the United States and upon Settling Defendants and their successors and assigns. Any change in ownership or corporate status of a Settling Defendant including, but not limited to, any transfer of assets or real or personal property, shall in no way alter such Settling Defendant's responsibilities under this Consent Decree.

3. Settling Defendants shall provide a copy of this Consent Decree to each contractor hired to perform the Work (as defined below) required by this Consent Decree and to each person representing any Settling Defendant with respect to the Waco Kansas Site or the Waco Missouri Site or the Work and shall condition all contracts entered into hereunder upon performance of the Work in conformity with the terms of this Consent Decree. Settling Defendants or their contractors shall provide written notice of the Consent Decree to all

subcontractors hired to perform any portion of the Work required by this Consent Decree. Settling Defendants shall nonetheless be responsible for ensuring that their contractors and subcontractors perform the Work contemplated herein in accordance with this Consent Decree. With regard to the activities undertaken pursuant to this Consent Decree, each contractor and subcontractor shall be deemed to be in a contractual relationship with the Settling Defendants within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).

IV. DEFINITIONS

4. Unless otherwise expressly provided herein, terms used in this Consent Decree which are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or in such regulations. Whenever terms listed below are used in this Consent Decree or in the appendices attached hereto and incorporated hereunder, the following definitions shall apply:

"CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601, *et seq*.

"Consent Decree" shall mean this Decree and all appendices attached hereto (listed in Section XXX). In the event of conflict between this Decree and any appendix, this Decree shall control.

"Day" shall mean a calendar day unless expressly stated to be a working day. "Working day" shall mean a day other than a Saturday, Sunday, or Federal holiday. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or Federal holiday, the period shall run until the close of business of the next working day.

"Effective Date" shall be the effective date of this Consent Decree as provided in Paragraph 105.

"EPA" shall mean the United States Environmental Protection Agency and any successor departments or agencies of the United States.

"KDHE" shall mean the Kansas Department of Health and Environment, and any successor departments or agencies of the State of Kansas.

"MDNR" shall mean the Missouri Department of Natural Resources, and any successor departments or agencies of the State of Missouri.

"Future Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States incurs in reviewing or developing plans, reports and other items pursuant to this Consent Decree, verifying the Work, or otherwise implementing, overseeing, or enforcing this Consent Decree, including, but not limited to, payroll costs, contractor costs, travel costs, laboratory costs, the costs incurred pursuant to Sections VII, IX (including, but not limited to, the cost of attorney time and any monies paid to secure access and/or to secure or implement institutional controls relating to Operation and Maintenance **(**but not to county-wide controls identified at page 18 of the Cherokee County OU-6 ROD or area-wide controls identified at page 30 of the Jasper County OU-1 ROD), including, but not limited to, the amount of just compensation), XV, and Paragraph 87 (Work Takeover) of Section XXI. Future Response Costs shall also include all Interim Response Costs, and all Interest on those Past Response Costs Settling Defendants have agreed to reimburse under this Consent Decree

that has accrued pursuant to 42 U.S.C. § 9607(a) from July 24, 2006 to the date of entry of this Consent Decree.

"Interim Response Costs" shall mean all costs, including direct and indirect costs, (a) paid by the United States in connection with the Waco Kansas Site or the Waco Missouri Site between July 24, 2006 and the Effective Date, or (b) incurred prior to the Effective Date but paid after that date.

"Interest," shall mean interest at the rate specified for interest on investments of the EPA Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. § 9607(a). The applicable rate of interest shall be the rate in effect at the time the interest accrues. The rate of interest is subject to change on October 1 of each year.

"National Contingency Plan" or "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan promulgated pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300, and any amendments thereto.

"Operation and Maintenance" or "O & M" shall mean all activities required to maintain the effectiveness of the Remedial Action as required under the Operation and Maintenance Plan approved or developed by EPA pursuant to this Consent Decree and the Statement of Work (SOW).

"Paragraph" shall mean a portion of this Consent Decree identified by an arabic numeral or an upper case letter.

"Parties" shall mean the United States and the Settling Defendants.

"Past Response Costs" shall mean all costs, including, but not limited to, direct and indirect costs, that the United States paid at or in connection with the Waco Kansas Site or the Waco Missouri Site during the period from October 1, 1980 to September 29, 1998 and from January 6, 2004 to July 24, 2006, plus Interest on all such costs which has accrued pursuant to 42 U.S.C. § 9607(a) through such date.

"Performance Standards" shall mean the cleanup standards and other measures of achievement of the goals of the Remedial Action, set forth in the Remedial Action Objectives in Section 2.8 and in Table 1 of the ROD for the Cherokee County Waco Subsite; and in Section 9.0 and subsections thereunder, of the ROD for the Jasper County Waco Designated Area and Waco Tributary.

"Plaintiff" shall mean the United States.

"RCRA" shall mean the Solid Waste Disposal Act, as amended, 42 U.S.C. §§ 6901 *et seq*. (also known as the Resource Conservation and Recovery Act).

"Record of Decision" or "ROD" shall mean, as appropriate to this Consent Decree, either the EPA Record of Decision relating to the OU-6 of the Cherokee County Superfund Site signed on September 30, 2004, by the Regional Administrator, EPA Region VII, or his/her delegate, and all attachments thereto, or the EPA Record of Decision relating to the OU-1 of the Jasper County Superfund Site signed on September 30, 2004, by the Regional Administrator, EPA Region VII, or his/her delegate, and all attachments thereto. The RODs are attached as Appendices A1 and A2.

"Remedial Action" shall mean those activities, except for Operation and Maintenance, to be undertaken by the Settling Defendants to implement the ROD, in accordance with the SOW and the final Remedial Design and Remedial Action Work Plans and other plans approved by EPA.

"Remedial Action Work Plan" shall mean the document developed pursuant to Paragraph 11 of this Consent Decree and approved by EPA, and any amendments thereto.

"Remedial Design" shall mean those activities to be undertaken by the Settling Defendants to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design Work Plan.

"Remedial Design Work Plan" shall mean the document developed pursuant to Paragraph 10 of this Consent Decree and approved by EPA, and any amendments thereto.

"Section" shall mean a portion of this Consent Decree identified by a Roman numeral.

"Settling Defendants" shall mean E.I. du Pont de Nemours and Company; NL Industries, Inc.; and Sunoco, Inc.

"Waco Kansas Site" for purposes of this Consent Decree shall mean the Waco Subsite of the Cherokee County, Kansas Superfund Site, encompassing approximately 560 acres, located in Cherokee County, Kansas, and depicted generally on the map attached as Appendix C1.

"Waco Missouri Site" shall mean the Waco Designated Area (DA) and Waco Tributary in the Oronogo-Duenweg Mining Belt Superfund Site, commonly known as the Jasper County

Superfund Site. The Waco DA, consisting of about four acres, and the Waco Tributary are depicted generally on the map attached as Appendix C1.

"Settling Defendant-Specific Work" for purposes of this Consent Decree shall mean the portion of the Work in specific areas within the Waco Kansas Site or the Waco Missouri Site for which each Settling Defendant is designated as the party performing such portion of the Work, as depicted in the map and accompanying legend attached as Appendix C2.

"State" shall mean either or both the State of Kansas or the State of Missouri, as appropriate to give meaning to this Consent Decree.

"Statement of Work" or "SOW" shall mean the statement of work for implementation of the Remedial Design and the Statement of Work for the Remedial Action (which includes the Operation and Maintenance) set forth in Appendices B1, B2 and B3 to this Consent Decree and any modifications made in accordance with this Consent Decree.

"Supervising Contractor" shall mean the principal contractor retained by each of the Settling Defendants to supervise and direct the implementation of the Work under this Consent Decree.

"United States" shall mean the United States of America.

"Waste Material" shall mean (1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (2) any pollutant or contaminant under Section 101(33), 42 U.S.C. § 9601(33); (3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27).

"Work" shall mean all activities Settling Defendants are required to perform under this Consent Decree, except those required by Section XXV (Retention of Records). For each individual Settling Defendant, "Work" shall mean such Settling Defendant's respective "Settling Defendant-Specific Work", as further described in Paragraph 6.b. and Appendix C2.

V. GENERAL PROVISIONS

5. Objectives of the Parties. The objectives of the Parties in entering into this Consent Decree are to protect public health or welfare or the environment at the Waco Missouri Site and the Waco Kansas Site by the design and implementation of response actions at the Waco Missouri Site and the Waco Kansas Site by the Settling Defendants, to reimburse response costs of the Plaintiff, and to resolve the claims of Plaintiff against Settling Defendants as provided in this Consent Decree.

6. Commitments by Settling Defendants.

a. Settling Defendants shall finance and perform the Work in accordance with this Consent Decree, the ROD, the SOW, and all work plans and other plans, standards, specifications, and schedules set forth herein or developed by Settling Defendants and approved by EPA pursuant to this Consent Decree. Settling Defendants shall also reimburse the United States for Past Response Costs and Future Response Costs as provided in this Consent Decree.

b. The obligations of each Settling Defendant to finance and perform the Work and to pay amounts owed the United States under this Consent Decree are limited to the Settling Defendant-Specific Work for which each Settling Defendant is designated in Appendix C2, and to response costs as specified in Section XVI (Payment for Response Costs). In the

event of the insolvency or other failure of any one or more Settling Defendants to implement the requirements of this Consent Decree, the remaining Settling Defendants are not required to complete Settling Defendant-Specific Work or payment of response costs for which it or they are not designated in Appendix C2 or specified as the party to pay response costs. If two or more Settling Defendants are designated to perform the work in the same area or pay response costs, then all such Settling Defendants so designated are jointly and severally liable and in the event of the insolvency or other failure of any one or more Settling Defendants to implement the requirements of this Consent Decree, and the remaining Settling Defendants are required to complete the designated Work and pay response costs. The obligations of this Consent Decree shall apply fully to each Settling Defendant as if each Settling Defendant had entered into a separate consent decree with the United States solely with regard to its respective Settling Defendant-Specific Work. Whether plural or singular forms are used in this Consent Decree, the form given effect shall be that form necessary to give effect to the division of Work into Settling Defendant-Specific Work pursuant to Appendix C2 and the payment of response costs as specified in Section XVI (Payment for Response Costs).

7. Compliance With Applicable Law. All activities undertaken by Settling Defendants pursuant to this Consent Decree shall be performed in accordance with the requirements of all applicable federal and state laws and regulations. Settling Defendants must also comply with all applicable or relevant and appropriate requirements of all Federal and state environmental laws as set forth in the RODs and the SOW. The activities conducted pursuant to this Consent Decree, if approved by EPA, shall be considered to be consistent with the NCP.

8. Permits.

a. As provided in Section 121(e) of CERCLA and Section 300.400(e) of the NCP, no permit shall be required for any portion of the Work conducted entirely on-site (i.e., within the areal extent of contamination or in very close proximity to the contamination and necessary for implementation of the Work). Where any portion of the Work that is not on-site requires a federal or state permit or approval, Settling Defendants shall submit timely and complete applications and take all other actions necessary to obtain all such permits or approvals.

b. The Settling Defendants may seek relief under the provisions of Section XVIII (Force Majeure) of this Consent Decree for any delay in the performance of the Work resulting from a failure to obtain, or a delay in obtaining, any permit required for the Work.

c. This Consent Decree is not, and shall not be construed to be, a permit issued pursuant to any federal or state statute or regulation.

VI. PERFORMANCE OF THE WORK BY SETTLING DEFENDANTS

9. Selection of Supervising Contractor.

a. All aspects of the Work to be performed by Settling Defendants pursuant to Sections VI (Performance of the Work by Settling Defendants), VII (Remedy Review), VIII (Quality Assurance, Sampling and Data Analysis), and XV (Emergency Response) of this Consent Decree shall be under the direction and supervision of the Supervising Contractor, the selection of which shall be subject to disapproval by EPA. Within 10 days after the lodging of this Consent Decree, Settling Defendants shall notify EPA in writing of the name, title, and qualifications of any contractor proposed to be the Supervising Contractor. With respect to any

contractor proposed to be Supervising Contractor, Settling Defendants shall demonstrate that the proposed contractor has a quality system that complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," (American National Standard, January 5, 1995), by submitting a copy of the proposed contractor's Quality Management Plan (QMP). The QMP should be prepared in accordance with "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA/240/B-01/002, March 2001) or equivalent documentation as determined by EPA. EPA will issue a notice of disapproval or an authorization to proceed. If at any time thereafter, Settling Defendants propose to change a Supervising Contractor, Settling Defendants shall give such notice to EPA and must obtain an authorization to proceed from EPA before the new Supervising Contractor performs, directs, or supervises any Work under this Consent Decree.

b. If EPA disapproves a proposed Supervising Contractor, EPA will notify Settling Defendants in writing. Settling Defendants shall submit to EPA a list of contractors, including the qualifications of each contractor, that would be acceptable to them within 30 days of receipt of EPA's disapproval of the contractor previously proposed. EPA will provide written notice of the names of any contractor(s) that it disapproves and an authorization to proceed with respect to any of the other contractors. Settling Defendants may select any contractor from that list that is not disapproved and shall notify EPA of the name of the contractor selected within 21 days of EPA's authorization to proceed.

c. If EPA fails to provide written notice of its authorization to proceed or disapproval as provided in this Paragraph and this failure prevents the Settling Defendants from

meeting one or more deadlines in a plan approved by the EPA pursuant to this Consent Decree, Settling Defendants may seek relief under the provisions of Section XVIII (Force Majeure) hereof.

10. Remedial Design.

a. Within sixty (60) days after EPA's issuance of an authorization to proceed pursuant to Paragraph 9, Settling Defendants shall submit to EPA a work plan for the design of the Remedial Action ("Remedial Design Work Plan" or "RD Work Plan") at the portions of the Waco Missouri Site and the Waco Kansas Site for which the Settling Defendants are designated as the parties performing such portion of the Work. The Remedial Design Work Plan shall provide for design of the remedy set forth in the ROD, in accordance with the SOW and for achievement of the Performance Standards and other requirements set forth in the ROD, this Consent Decree and/or the SOW. Upon its approval by EPA, the Remedial Design Work Plan shall be incorporated into and become enforceable under this Consent Decree. Within sixty (60) days after EPA's issuance of an authorization to proceed, the Settling Defendants shall submit to EPA and the State a Health and Safety Plan for field design activities which conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120.

b. The Remedial Design Work Plan shall include plans and schedules for implementation of all remedial design and pre-design tasks identified in the SOW, including, but not limited to, plans and schedules for the completion of: the pre-design and design document sequence specified in the final approved RD work plan; a design analysis report; a chemical data acquisition plan; an O&M plan for post remedy implementation; a quality assurance project

plan; a site safety plan; cost and schedule estimates; a community relations plan; an organizational chart; and progress reports. In addition, the Remedial Design Work Plan shall include a schedule for completion of the Remedial Action Work Plan.

c. Upon approval of the Remedial Design Work Plan by EPA, after a reasonable opportunity for review and comment by the State, and submittal of the Health and Safety Plan for all field activities to EPA and the State, Settling Defendants shall implement the Remedial Design Work Plan. The Settling Defendants shall submit to EPA and the State all plans, submittals and other deliverables required under the approved Remedial Design Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Unless otherwise directed by EPA, Settling Defendants shall not commence further Remedial Design activities at the Waco Missouri Site or the Waco Kansas Site prior to approval of the Remedial Design Work Plan.

11. Remedial Action.

a. Within sixty (60) days after the approval of the final design submittal, Settling Defendants shall submit to EPA and the State a work plan for the performance of the Remedial Action at the Waco Missouri Site and the Waco Kansas Site ("Remedial Action Work Plan") for the portions of the Waco Missouri Site and the Waco Kansas Site for which the Settling Defendants are designated as the parties performing such portion of the Work. The Remedial Action Work Plan shall provide for construction and implementation of the remedy set forth in the ROD and achievement of the Performance Standards, in accordance with this Consent Decree, the ROD, the SOW, and the design plans and specifications developed in accordance with the Remedial Design Work Plan and approved by EPA. Upon its approval by

EPA, the Remedial Action Work Plan shall be incorporated into and become enforceable under this Consent Decree. At the same time as they submit the Remedial Action Work Plan, Settling Defendants shall submit to EPA and the State a Health and Safety Plan for field activities required by the Remedial Action Work Plan which conforms to the applicable Occupational Safety and Health Administration and EPA requirements including, but not limited to, 29 C.F.R. § 1910.120.

b. The Remedial Action Work Plan shall include the following: prepare a work plan that includes the components of the competed Remedial Design. The Remedial Action Work Plan also shall include the methodology for implementation of the Construction Quality Assurance Plan and a schedule for implementation of all Remedial Action tasks identified in the final design submittal and shall identify the initial formulation of the Settling Defendants' Remedial Action Project Team (including, but not limited to, the Supervising Contractor).

c. Upon approval of the Remedial Action Work Plan by EPA, after a reasonable opportunity for review and comment by the State, Settling Defendants shall implement the activities required under the Remedial Action Work Plan. The Settling Defendants shall submit to EPA and the State all plans, submittals, or other deliverables required under the approved Remedial Action Work Plan in accordance with the approved schedule for review and approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Unless otherwise directed by EPA, Settling Defendants shall not commence physical Remedial Action activities at the Waco Missouri Site or the Waco Kansas Site prior to approval of the Remedial Action Work Plan.

12. The Settling Defendants shall continue to implement the Remedial Action and O&M until the Performance Standards are achieved and for so long thereafter as is otherwise required under this Consent Decree.

13. Modification of the SOW or Related Work Plans.

a. If EPA determines that modification to the work specified in the SOW and/or in work plans developed pursuant to the SOW is necessary to achieve and maintain the Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the ROD, EPA may require that such modification be incorporated in the SOW and/or such work plans, provided, however, that a modification may only be required pursuant to this Paragraph to the extent that it is consistent with the scope of the remedy selected in the RODs.

b. For the purposes of this Paragraph 13 and Paragraph 49 only, the "scope of the remedy selected in the ROD" is: implementation of the selected remedy and achievement of the performance standards applicable, as appropriate, to either the Waco Kansas Site or the Waco Missouri Site.

c. If Settling Defendants object to any modification determined by EPA to be necessary pursuant to this Paragraph, they may seek dispute resolution pursuant to Section XIX (Dispute Resolution), Paragraph 67 (record review). The SOW and/or related work plans shall be modified in accordance with final resolution of the dispute.

d. Settling Defendants shall implement any work required by any modifications incorporated in the SOW and/or in work plans developed pursuant to the SOW in accordance with this Paragraph.

e. Nothing in this Paragraph shall be construed to limit EPA's authority to require performance of further response actions as otherwise provided in this Consent Decree.

14. Settling Defendants acknowledge and agree that nothing in this Consent Decree, the SOW, or the Remedial Design or Remedial Action Work Plans constitutes a warranty or representation of any kind by Plaintiff that compliance with the work requirements set forth in the SOW and the Work Plans will achieve the Performance Standards.

15. a. Settling Defendants shall, prior to any off-site shipment of Waste Material from the Waco Missouri Site or the Waco Kansas Site (which includes but is not limited to shipment across the Missouri-Kansas state line) to an out-of-state waste management facility, provide written notification to the appropriate state environmental official in the receiving facility's state and to the EPA Project Coordinator of such shipment of Waste Material. However, this notification requirement shall not apply to any off-site shipments when the total volume of all such shipments will not exceed 10 cubic yards.

(1) The Settling Defendants shall include in the written notification the following information, where available: (1) the name and location of the facility to which the Waste Material is to be shipped; (2) the type and quantity of the Waste Material to be shipped; (3) the expected schedule for the shipment of the Waste Material; and (4) the method of transportation. The Settling Defendants shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the Waste Material to another facility within the same state, or to a facility in another state.

(2) The identity of the receiving facility and state will be determined by the Settling Defendants following the award of the contract for Remedial Action construction. The Settling Defendants shall provide the information required by Paragraph 15.a as soon as practicable after the award of the contract and before the Waste Material is actually shipped.

b. Before shipping any hazardous substances, pollutants, or contaminants from the Waco Missouri Site or the Waco Kansas Site (which includes but is not limited to shipment across the Missouri-Kansas state line) to an off-site location, Settling Defendants shall obtain EPA's certification that the proposed receiving facility is operating in compliance with the requirements of CERCLA Section 121(d)(3) and 40 C.F.R. 300.440. Settling Defendants shall only send hazardous substances, pollutants, or contaminants from the Waco Missouri Site or the Waco Kansas Site to an off-site facility that complies with the requirements of the statutory provision and regulations cited in the preceding sentence.

VII. REMEDY REVIEW

16. Periodic Review. Settling Defendants shall conduct any studies and investigations as requested by EPA, in order to permit EPA to conduct reviews of whether the Remedial Action is protective of human health and the environment at least every five years as required by Section 121(c) of CERCLA and any applicable regulations.

17. EPA Selection of Further Response Actions. If EPA determines, at any time, that the Remedial Action is not protective of human health and the environment, EPA may select further response actions for the Waco Missouri Site or the Waco Kansas Site in accordance with the requirements of CERCLA and the NCP.

18. Opportunity To Comment. Settling Defendants and, if required by Sections 113(k)(2) or 117 of CERCLA, the public, will be provided with an opportunity to comment on any further response actions proposed by EPA as a result of the review conducted pursuant to Section 121(c) of CERCLA and to submit written comments for the record during the comment period.

19. Settling Defendants' Obligation To Perform Further Response Actions. If EPA selects further response actions for the Sites portions of the Waco Missouri Site and the Waco Kansas Site for which the Settling Defendants are designated as the parties performing such portion of the Work, the Settling Defendants shall undertake such further response actions to the extent that the reopener conditions in Paragraph 83 or Paragraph 84 (United States' reservations of liability based on unknown conditions or new information) are satisfied. Settling Defendants may invoke the procedures set forth in Section XIX (Dispute Resolution) to dispute (1) EPA's determination that the reopener conditions of Paragraph 83 or Paragraph 84 of Section XXI (Covenants Not To Sue by Plaintiff) are satisfied, (2) EPA's determination that the Remedial Action is not protective of human health and the environment, or (3) EPA's selection of the further response actions. Disputes pertaining to whether the Remedial Action is protective or to EPA's selection of further response actions shall be resolved pursuant to Paragraph 67 (record review).

20. Submissions of Plans. If Settling Defendants are required to perform the further response actions pursuant to Paragraph 19, they shall submit a plan for such work to EPA for approval in accordance with the procedures set forth in Section VI (Performance of the Work by

Settling Defendants) and shall implement the plan approved by EPA in accordance with the provisions of this Decree.

VIII. QUALITY ASSURANCE, SAMPLING, AND DATA ANALYSIS

21. Settling Defendants shall use quality assurance, quality control, and chain of custody procedures for all treatability, design, compliance and monitoring samples in accordance with "EPA Requirements for Quality Assurance Project Plans (QA/R5)" (EPA/240/B-01/003, March 2001) "Guidance for Quality Assurance Project Plans (QA/G-5)" (EPA/600/R-98/018, February 1998), and subsequent amendments to such guidelines upon notification by EPA to Settling Defendants of such amendment. Amended guidelines shall apply only to procedures conducted after such notification. Prior to the commencement of any monitoring project under this Consent Decree, Settling Defendants shall submit to EPA for approval, after a reasonable opportunity for review and comment by the State, a Quality Assurance Project Plan ("QAPP") that is consistent with the SOW, the NCP and any applicable guidance documents. If relevant to the proceeding, the Parties agree that validated sampling data generated in accordance with the QAPP(s) and reviewed and approved by EPA shall be admissible as evidence, without objection, in any proceeding under this Decree. Settling Defendants shall ensure that EPA and State personnel and their authorized representatives are allowed access at reasonable times to all laboratories utilized by Settling Defendants in implementing this Consent Decree. In addition, Settling Defendants shall ensure that such laboratories shall analyze all samples submitted by EPA pursuant to the QAPP for quality assurance monitoring. Settling Defendants shall ensure that the laboratories they utilize for the analysis of samples taken pursuant to this Decree perform all analyses according to accepted EPA methods. Accepted EPA methods consist of

those methods which are documented in the "Contract Lab Program Statement of Work for Inorganic Analysis" and the "Contract Lab Program Statement of Work for Organic Analysis," dated February 1988, and any amendments made thereto during the course of the implementation of this Decree; however, upon approval by EPA, after opportunity for review and comment by the State, the Settling Defendants may use other analytical methods which are as stringent as or more stringent than the CLP- approved methods. Settling Defendants shall ensure that all laboratories they use for analysis of samples taken pursuant to this Consent Decree participate in an EPA or EPA-equivalent QA/QC program. Settling Defendants shall only use laboratories that have a documented Quality System which complies with ANSI/ASQC E4-1994, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs," (American National Standard, January 5, 1995), and "EPA Requirements for Quality Management Plans (QA/R-2)," (EPA/240/B-01/002, March 2001) or equivalent documentation as determined by EPA. EPA may consider laboratories accredited under the National Environmental Laboratory Accreditation Program (NELAP) as meeting the Quality System requirements. Settling Defendants shall ensure that all field methodologies utilized in collecting samples for subsequent analysis pursuant to this Decree will be conducted in accordance with the procedures set forth in the QAPP approved by EPA.

22. Upon request, the Settling Defendants shall allow split or duplicate samples to be taken by EPA and the State or their authorized representatives. Settling Defendants shall notify EPA and the State not less than 30 days in advance of any sample collection activity unless shorter notice is agreed to by EPA. In addition, EPA and the State shall have the right to take any additional samples that EPA or the State deem necessary. Upon request, EPA and the State

shall allow the Settling Defendants to take split or duplicate samples of any samples they take as part of the Plaintiff's oversight of the Settling Defendants' implementation of the Work.

23. Settling Defendants shall submit one copy to EPA and one copy to the State of the results of all sampling and/or tests or other data obtained or generated by or on behalf of Settling Defendants with respect to the Waco Missouri Site or the Waco Kansas Site and/or the implementation of this Consent Decree unless EPA agrees otherwise.

24. Notwithstanding any provision of this Consent Decree, the United States and the State hereby retain all of their information gathering and inspection authorities and rights, including enforcement actions related thereto, under CERCLA, RCRA and any other applicable statutes or regulations.

IX. ACCESS AND INSTITUTIONAL CONTROLS

25. If the Waco Missouri Site or the Waco Kansas Site , or any other property where access and/or land/water use restrictions relating to Operation and Maintenance (but not to county-wide controls identified at page 18 of the Cherokee County OU-6 ROD or area-wide controls identified at page 30 of the Jasper County OU-1 ROD), are needed to implement this Consent Decree, is owned or controlled by any of the Settling Defendants, such Settling Defendant shall:

a. commencing on the date of lodging of this Consent Decree, provide the United States, the State, and their representatives, including EPA and its contractors, with access at all reasonable times to the Waco Missouri Site and the Waco Kansas Site , or such

other property, for the purpose of conducting any activity related to this Consent Decree including, but not limited to, the following activities:

(1) Monitoring the Work;

(2) Verifying any data or information submitted to the United States or the State;

(3) Conducting investigations relating to contamination at or near the Waco Missouri Site or the Waco Kansas Site ;

(4) Obtaining samples;

(5) Assessing the need for, planning, or implementing additional response actions at or near the Waco Missouri Site or the Waco Kansas Site;

(6) Assessing implementation of quality assurance and quality control practices as defined in the approved Quality Assurance Project Plans;

(7) Implementing the Work pursuant to the conditions set forth in Paragraph 87 of this Consent Decree;

(8) Inspecting and copying records, operating logs, contracts, or other documents maintained or generated by Settling Defendants or their agents, consistent with Section XXIV (Access to Information);

(9) Assessing Settling Defendants' compliance with this Consent Decree; and

(10) Determining whether the Waco Missouri Site or the Waco Kansas Site or other property is being used in a manner that is prohibited or restricted, or that may need to be prohibited or restricted, by or pursuant to this Consent Decree;

26. If the Waco Missouri Site or the Waco Kansas Site, or any other property where access and/or land/water use restrictions relating to Operation and Maintenance (but not to county-wide controls identified at page 18 of the Cherokee County OU-6 ROD or area-wide controls identified at page 30 of the Jasper County OU-1 ROD), are needed to implement this Consent Decree, is owned or controlled by persons other than any of the Settling Defendants, Settling Defendants shall use best efforts to secure from such persons:

a. an agreement to provide access thereto for Settling Defendants, as well as for the United States on behalf of EPA, and the State, as well as their representatives (including contractors), for the purpose of conducting any activity related to this Consent Decree including, but not limited to, those activities listed in Paragraph 25.a of this Consent Decree;

27. For purposes of Paragraph 26 of this Consent Decree, "best efforts" includes the payment of reasonable sums of money in consideration of access, access easements, land/water use restrictions, restrictive easements, and/or an agreement to release or subordinate a prior lien or encumbrance relating to Operation and Maintenance (but not to county-wide controls identified at page 18 of the Cherokee County OU-6 ROD or area-wide controls identified at page 30 of the Jasper County OU-1 ROD). If any access or land/water use restriction agreements relating to Operation and Maintenance (but not to county-wide controls identified at page 18 of the Cherokee County OU-6 ROD or area-wide controls identified at page 30 of the Jasper County OU-1 ROD), required by Paragraph 26.a of this Consent Decree are not obtained by the

completion date of the remedial design work plan for access agreements and by the completion of remedial action construction for land use restrictions, Settling Defendants shall promptly notify the United States in writing, and shall include in that notification a summary of the steps that Settling Defendants have taken to attempt to comply with Paragraph 26 of this Consent Decree. The United States may, as it deems appropriate, assist Settling Defendants in obtaining access or land/water use restrictions relating to Operation and Maintenance (but not to county-wide controls identified at page 18 of the Cherokee County OU-6 ROD or area-wide controls identified at page 30 of the Jasper County OU-1 ROD), either in the form of contractual agreements or in the form of easements running with the land. Settling Defendants shall reimburse the United States in accordance with the procedures in Section XVI (Payments for Response Costs), for all costs incurred, direct or indirect, by the United States in obtaining such access and/or land/water use restrictions relating to Operation and Maintenance (but not to county-wide controls identified at page 18 of the Cherokee County OU-6 ROD or area-wide controls identified at page 30 of the Jasper County OU-1 ROD), including, but not limited to, the cost of attorney time and the amount of monetary consideration paid or just compensation.

28. If EPA determines that land/water use restrictions relating to Operation and Maintenance (but not to county-wide controls identified at page 18 of the Cherokee County OU-6 ROD or area-wide controls identified at page 30 of the Jasper County OU-1 ROD), in the form of state or local laws, regulations, ordinances or other governmental controls, are needed to implement the remedy selected in the ROD, ensure the integrity and protectiveness thereof, or ensure non-interference therewith, Settling Defendants shall cooperate with EPA's and the State's efforts to secure such governmental controls.

29. Notwithstanding any provision of this Consent Decree, the United States and the State retain all of its access authorities and rights, as well as all of their rights to require land/water use restrictions, including enforcement authorities related thereto, under CERCLA, RCRA and any other applicable statute or regulations.

X. REPORTING REQUIREMENTS

30. In addition to any other requirement of this Consent Decree, Settling Defendants shall submit two copies to EPA and one copy to the State of written monthly progress reports that: (a) describe the actions which have been taken toward achieving compliance with this Consent Decree during the previous month; (b) include a summary of all results of sampling and tests and all other data received or generated by Settling Defendants or their contractors or agents in the previous month; (c) identify all work plans, plans and other deliverables required by this Consent Decree completed and submitted during the previous month; (d) describe all actions, including, but not limited to, data collection and implementation of work plans, which are scheduled for the next two months and provide other information relating to the progress of construction, including, but not limited to, critical path diagrams, Gantt charts and Pert charts; (e) include information regarding percentage of completion, unresolved delays encountered or anticipated that may affect the future schedule for implementation of the Work, and a description of efforts made to mitigate those delays or anticipated delays; (f) include any modifications to the work plans or other schedules that Settling Defendants have proposed to EPA or that have been approved by EPA; and (g) describe all activities undertaken in support of the Community Relations Plan during the previous month and those to be undertaken in the next two months.

Settling Defendants shall submit these progress reports to EPA and the State by the tenth day of every month following the lodging of this Consent Decree until EPA notifies the Settling Defendants pursuant to Paragraph 50.b of Section XIV (Certification of Completion). If requested by EPA, Settling Defendants shall also provide briefings for EPA to discuss the progress of the Work.

31. The Settling Defendants shall notify EPA of any change in the schedule described in the monthly progress report for the performance of any activity, including, but not limited to, data collection and implementation of work plans, no later than seven days prior to the performance of the activity.

32. Upon the occurrence of any event during performance of the Work that Settling Defendants are required to report pursuant to Section 103 of CERCLA or Section 304 of the Emergency Planning and Community Right-to-know Act (EPCRA), Settling Defendants shall within 24 hours of the onset of such event orally notify the EPA Project Coordinator or the Alternate EPA Project Coordinator (in the event of the unavailability of the EPA Project Coordinator), or, in the event that neither the EPA Project Coordinator or Alternate EPA Project Coordinator is available, the Emergency Response Section, Region VII, United States Environmental Protection Agency. These reporting requirements are in addition to the reporting required by CERCLA Section 103 or EPCRA Section 304.

33. Within 20 days of the onset of such an event, Settling Defendants shall furnish to Plaintiff a written report, signed by the Settling Defendants' Project Coordinator, setting forth the events which occurred and the measures taken, and to be taken, in response thereto. Within 30

days of the conclusion of such an event, Settling Defendants shall submit a report setting forth all actions taken in response thereto.

34. Settling Defendants shall submit two copies of all plans, reports, and data required by the SOW, the Remedial Design Work Plan, the Remedial Action Work Plan, or any other approved plans to EPA in accordance with the schedules set forth in such plans. Settling Defendants shall simultaneously submit one copy of all such plans, reports and data to the State. Upon request by EPA Settling Defendants shall submit in electronic form all portions of any report or other deliverable Settling Defendants are required to submit pursuant to the provisions of this Consent Decree.

35. All reports and other documents submitted by Settling Defendants to EPA (other than the monthly progress reports referred to above) which purport to document Settling Defendants' compliance with the terms of this Consent Decree shall be signed by an authorized representative of the Settling Defendants.

XI. EPA APPROVAL OF PLANS AND OTHER SUBMISSIONS

36. After review of any plan, report or other item which is required to be submitted for approval pursuant to this Consent Decree, EPA, after reasonable opportunity for review and comment by the State, shall: (a) approve, in whole or in part, the submission; (b) approve the submission upon specified conditions; (c) modify the submission to cure the deficiencies; (d) disapprove, in whole or in part, the submission, directing that the Settling Defendants modify the submission; or (e) any combination of the above. However, EPA shall not modify a submission without first providing Settling Defendants at least one notice of deficiency and an

opportunity to cure within 20 days, except where to do so would cause serious disruption to the Work or where previous submission(s) have been disapproved due to material defects and the deficiencies in the submission under consideration indicate a bad faith lack of effort to submit an acceptable deliverable.

37. In the event of approval, approval upon conditions, or modification by EPA, pursuant to Paragraph 36(a), (b), or (c), Settling Defendants shall proceed to take any action required by the plan, report, or other item, as approved or modified by EPA subject only to their right to invoke the Dispute Resolution procedures set forth in Section XIX (Dispute Resolution) with respect to the modifications or conditions made by EPA. In the event that EPA modifies the submission to cure the deficiencies pursuant to Paragraph 36(c) and the submission has a material defect, EPA retains its right to seek stipulated penalties, as provided in Section XX (Stipulated Penalties).

38. Resubmission of Plans.

a. Upon receipt of a notice of disapproval pursuant to Paragraph 36(d), Settling Defendants shall, within 20 days or such longer time as specified by EPA in such notice, correct the deficiencies and resubmit the plan, report, or other item for approval. Any stipulated penalties applicable to the submission, as provided in Section XX (Stipulated Penalties), shall accrue during the 20-day period or otherwise specified period but shall not be payable unless the resubmission is disapproved or modified due to a material defect as provided in Paragraphs 39 and 40.

b. Notwithstanding the receipt of a notice of disapproval pursuant to Paragraph 36(d), Settling Defendants shall proceed, at the direction of EPA, to take any action required by any non-deficient portion of the submission. Implementation of any non-deficient portion of a submission shall not relieve Settling Defendants of any liability for stipulated penalties under Section XX (Stipulated Penalties).

39. In the event that a resubmitted plan, report or other item, or portion thereof, is disapproved by EPA, EPA may again require the Settling Defendants to correct the deficiencies, in accordance with the preceding Paragraphs. EPA also retains the right to modify or develop the plan, report or other item. Settling Defendants shall implement any such plan, report, or item as modified or developed by EPA, subject only to their right to invoke the procedures set forth in Section XIX (Dispute Resolution).

40. If upon resubmission, a plan, report, or item is disapproved or modified by EPA due to a material defect, Settling Defendants shall be deemed to have failed to submit such plan, report, or item timely and adequately unless the Settling Defendants invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution) and EPA's action is overturned pursuant to that Section. The provisions of Section XIX (Dispute Resolution) and Section XX (Stipulated Penalties) shall govern the implementation of the Work and accrual and payment of any stipulated penalties during Dispute Resolution. If EPA's disapproval or modification is upheld, stipulated penalties shall accrue for such violation from the date on which the initial submission was originally required, as provided in Section XX (Stipulated Penalties).

41. All plans, reports, and other items required to be submitted to EPA under this Consent Decree shall, upon approval or modification by EPA, be enforceable under this Consent Decree. In the event EPA approves or modifies a portion of a plan, report, or other item required to be submitted to EPA under this Consent Decree, the approved or modified portion shall be enforceable under this Consent Decree.

XII. PROJECT COORDINATORS

42. Within 20 days of lodging this Consent Decree, Settling Defendants and EPA will notify each other, in writing, of the name, address and telephone number of their respective designated Project Coordinators and Alternate Project Coordinators. The EPA, after consultation with the State, will notify the Settling Defendants, in writing, of the name, address and telephone number of the State's designated Project Coordinator and Alternate Project Coordinator. If a Project Coordinator or Alternate Project Coordinator initially designated is changed, the identity of the successor will be given to the other Parties at least 5 working days before the changes occur, unless impracticable, but in no event later than the actual day the change is made. The Settling Defendants' Project Coordinator shall be subject to disapproval by EPA and shall have the technical expertise sufficient to adequately oversee all aspects of the Work. The Settling Defendants' Project Coordinator shall not be an attorney for any of the Settling Defendants in this matter. He or she may assign other representatives, including other contractors, to serve as a site representative for oversight of performance of daily operations during remedial activities.

43. Plaintiff may designate other representatives, including, but not limited to, EPA and State employees, and federal and State contractors and consultants, to observe and monitor

the progress of any activity undertaken pursuant to this Consent Decree. EPA's Project Coordinator and Alternate Project Coordinator shall have the authority lawfully vested in a Remedial Project Manager (RPM) and an On-Scene Coordinator (OSC) by the National Contingency Plan, 40 C.F.R. Part 300. In addition, EPA's Project Coordinator or Alternate Project Coordinator shall have authority, consistent with the National Contingency Plan, to halt any Work required by this Consent Decree and to take any necessary response action when s/he determines that conditions at the Waco Missouri Site or the Waco Kansas Site constitute an emergency situation or may present an immediate threat to public health or welfare or the environment due to release or threatened release of Waste Material.

44. EPA's Project Coordinator and the Settling Defendants' Project Coordinator will meet, or communicate telephonically, at a minimum, on a monthly basis.

XIII. ASSURANCE OF ABILITY TO COMPLETE WORK

45. Settling Defendants shall demonstrate their ability to complete the Work and to pay all claims that arise from performance of the Work, bythe method set forth in Paragraph 45.a. herein:

a. Within thirty (30) days after the entry of this Consent Decree, Settling Defendants shall establish and maintain financial security for the benefit of the United States in the amount of $2.60 million, apportioned to Settling Defendant-Specific Work as follows: E.I. du Pont de Nemours and Company–$260,000.00; NL Industries, Inc.–$780,000.00; and Sunoco, Inc.–$1,560,000.00, in one or more of the following forms:

(1) a surety bond guaranteeing performance of the Work;

(2) one or more irrevocable letters of credit equaling the total estimated cost of the Work;

(3) a trust fund;

(4) a guarantee to perform the Work by one or more parent corporations or subsidiaries, or by one or more unrelated corporations that have a substantial business relationship with at least one of the Settling Performing Defendants;

(5) a demonstration that one or more of the Settling Defendants satisfy the requirements of 40 C.F.R. § 264.143(f) (NOTE: For these purposes, references in 40 C.F.R. § 264.143(f) to "the sum of the current closure and post-closure cost estimates and the current plugging and abandonment cost estimates" shall mean the amount of financial security specified above). If the Settling Defendants who seek to provide a demonstration under 40 C.F.R. § 264.143(f) are providing a similar demonstration at other RCRA or CERCLA sites, the amount for which they are providing financial assurance at those other sites shall be added to the estimated costs of the Work from this paragraph. Such financial security shall be maintained by the Settling Defendants until EPA agrees that the Work has been completed and issues a Certification of Completion in accordance with Paragraph 50.b. The amount of financial security may be reduced in accordance with Paragraph 47.

46. a. If the Settling Performing Defendants seek to demonstrate the ability to complete the Work through a guarantee by a third party pursuant to Paragraph 45.a.(4) of this Consent Decree, Settling Performing Defendants shall demonstrate that the guarantor satisfies the requirements of 40 C.F.R. § 264.143(f). If Settling Performing Defendants seek to

demonstrate their ability to complete the Work by means of the financial test or the corporate guarantee pursuant to Paragraph 45.a.(4) or 45.a.(5), they shall resubmit sworn statements conveying the information required by 40 C.F.R. § 264.143(f) annually, on the anniversary of the Effective Date. If the Settling Performing Defendants seek to demonstrate their ability to complete the Work through the use of more than one of the forms identified under Paragraph 45.a., the choice of such forms shall be limited to those in Paragraphs 45.a.(1), (2), and/or (3).

b. In the event that EPA, after a reasonable opportunity for review and comment by the State, determines at any time that the financial assurances provided pursuant to this Section are inadequate, Settling Performing Defendants shall, within thirty (30) days of receipt of notice of EPA's determination, obtain and present to EPA for approval one of the other forms of financial assurance listed in Paragraph 45.a. of this Consent Decree.

c. Settling Performing Defendants' inability to demonstrate financial ability to complete the Work shall not excuse performance of any activities required under this Consent Decree.

47. If Settling Defendants can show that the estimated cost to complete the remaining Work has diminished below the amount set forth in Paragraph 45 above after entry of this Consent Decree, Settling Defendants may, on any anniversary date of entry of this Consent Decree, or at any other time agreed to by the Parties, reduce the amount of the financial security provided under this Section to the estimated cost of the remaining work to be performed. Settling Defendants shall submit a proposal for such reduction to EPA, in accordance with the requirements of this Section, and may reduce the amount of the security upon approval by EPA. In the event of a dispute, Settling Defendants may reduce the amount of the security in accordance with the final administrative or judicial decision resolving the dispute.

48. Settling Defendants may change the form of financial assurance provided under this Section at any time, upon notice to and approval by EPA, provided that the new form of assurance meets the requirements of this Section. In the event of a dispute, Settling Defendants may change the form of the financial assurance only in accordance with the final administrative or judicial decision resolving the dispute.

XIV. Certification of Completion

49. Completion of the Remedial Action.

a. Within 90 days after Settling Defendants conclude that the Remedial Action has been fully performed and the Performance Standards have been attained, Settling Defendants shall schedule and conduct a pre-certification inspection to be attended by Settling Defendants, EPA, and the State. If, after the pre-certification inspection, the Settling Defendants still believe that the Remedial Action has been fully performed and the Performance Standards have been attained, they shall submit a written report requesting certification to EPA for approval, with a copy to the State, pursuant to Section XI (EPA Approval of Plans and Other Submissions) within 30 days of the inspection. In the report, a registered professional engineer and the Settling Defendants' Project Coordinator shall state that the Remedial Action has been completed in full satisfaction of the requirements of this Consent Decree. The written report shall include as-built drawings signed and stamped by a professional engineer. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendants' Project Coordinator:

> To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If, after completion of the pre-certification inspection and receipt and review of the written report, EPA, after reasonable opportunity to review and comment by the State, determines that the Remedial Action or any portion thereof has not been completed in accordance with this Consent Decree or that the Performance Standards have not been achieved, EPA will notify Settling Defendants in writing of the activities that must be undertaken by Settling Defendants pursuant to this Consent Decree to complete the Remedial Action and achieve the Performance Standards, provided, however, that EPA may only require Settling Defendants to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy selected in the ROD," as that term is defined in Paragraph 13.b. EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the SOW or require the Settling Defendants to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Settling Defendants shall perform all activities described in the notice in accordance with the specifications and schedules established pursuant to this Paragraph, subject to their right to invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent report requesting Certification of Completion and after a reasonable opportunity for review and comment by the

State, that the Remedial Action has been performed in accordance with this Consent Decree and that the Performance Standards have been achieved, EPA will so certify in writing to Settling Defendants. This certification shall constitute the Certification of Completion of the Remedial Action for purposes of this Consent Decree, including, but not limited to, Section XXI (Covenants Not to Sue by Plaintiff). Certification of Completion of the Remedial Action shall not affect Settling Defendants' obligations under this Consent Decree.

50. Completion of the Work.

a. Within 90 days after Settling Defendants conclude that all phases of the Work (including O & M), have been fully performed, Settling Defendants shall schedule and conduct a pre-certification inspection to be attended by Settling Defendants, EPA and the State. If, after the pre-certification inspection, the Settling Defendants still believe that the Work has been fully performed, Settling Defendants shall submit a written report by a registered professional engineer stating that the Work has been completed in full satisfaction of the requirements of this Consent Decree. The report shall contain the following statement, signed by a responsible corporate official of a Settling Defendant or the Settling Defendants' Project Coordinator:

> To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If, after review of the written report, EPA, after reasonable opportunity to review and comment by the State, determines that any portion of the Work has not been completed in accordance with this Consent Decree, EPA will notify Settling Defendants in writing of the activities that must be undertaken by Settling Defendants pursuant to this Consent Decree to complete the Work, provided, however, that EPA may only require Settling Defendants to perform such activities pursuant to this Paragraph to the extent that such activities are consistent with the "scope of the remedy selected in the ROD," as that term is defined in Paragraph 13.b. EPA will set forth in the notice a schedule for performance of such activities consistent with the Consent Decree and the SOW or require the Settling Defendants to submit a schedule to EPA for approval pursuant to Section XI (EPA Approval of Plans and Other Submissions). Settling Defendants shall perform all activities described in the notice in accordance with the specifications and schedules established therein, subject to their right to invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution).

b. If EPA concludes, based on the initial or any subsequent request for Certification of Completion by Settling Defendants and after a reasonable opportunity for review and comment by the State, that the Work has been performed in accordance with this Consent Decree, EPA will so notify the Settling Defendants in writing.

XV. EMERGENCY RESPONSE

51. In the event of any action or occurrence during the performance of the Work which causes or threatens a release of Waste Material from the Waco Missouri Site or the Waco Kansas Site that constitutes an emergency situation or may present an immediate threat to public health or welfare or the environment, Settling Defendants shall, subject to Paragraph 52,

immediately take all appropriate action to prevent, abate, or minimize such release or threat of release, and shall immediately notify the EPA's Project Coordinator, or, if the Project Coordinator is unavailable, EPA's Alternate Project Coordinator. If neither of these persons is available, the Settling Defendants shall notify the EPA Emergency Response Section, Region VII. Settling Defendants shall take such actions in consultation with EPA's Project Coordinator or other available authorized EPA officer and in accordance with all applicable provisions of the Health and Safety Plans, the Contingency Plans, and any other applicable plans or documents developed pursuant to the SOW. In the event that Settling Defendants fail to take appropriate response action as required by this Section, and EPA takes such action instead, Settling Defendants shall reimburse EPA all costs of the response action not inconsistent with the NCP pursuant to Section XVI (Payments for Response Costs).

52. Nothing in the preceding Paragraph or in this Consent Decree shall be deemed to limit any authority of the United States, or the State, a) to take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Waco Missouri Site or the Waco Kansas Site, or b) to direct or order such action, or seek an order from the Court, to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of Waste Material on, at, or from the Waco Missouri Site or the Waco Kansas Site, subject to Section XXI (Covenants Not to Sue by Plaintiff).

XVI. PAYMENTS FOR RESPONSE COSTS

53. Payments for Past Response Costs.

a. Within sixty (60) days of the Effective Date, Settling Defendants shall pay to EPA seven thousand six hundred and fifty dollars ($7,650.00) in payment for Past Response Costs, apportioned as follows: E.I. du Pont de Nemours and Company-$765.00; NL Industries, Inc.–$2,295.00; and Sunoco, Inc.–$4,590.00, Payment shall be made by FedWire Electronic Funds Transfer ("EFT") to the U.S. Department of Justice account in accordance with current EFT procedures, referencing EPA Site/Spill ID Number 0737, and DOJ Case Number 90-11-2-08539. In addition, within sixty (60) days of the Effective Date, Settling Defendant Sunoco, Inc. shall pay to EPA fifteen thousand six hundred and thirty-eight dollars ($15,638.00) in payment for Past Response Costs. Payment shall be made by FedWire Electronic Funds Transfer ("EFT") to the U.S. Department of Justice account in accordance with current EFT procedures, referencing EPA Site/Spill ID Number 0736, and DOJ Case Number 90-11-2-08539. Payment shall be made in accordance with instructions provided to the Settling Defendants by the Financial Litigation Unit of the United States Attorney's Office for the District of Kansas following lodging of the Consent Decree. Any payments received by the Department of Justice after 4:00 p.m. (Eastern Time) will be credited on the next business day.

b. At the time of payment, Settling Defendants shall send notice that payment has been made to the United States, to EPA and to the Regional Financial Management Officer, in accordance with Section XXVI (Notices and Submissions).

c. The total amount to be paid by Setting Defendants pursuant to Subparagraph 53.a referencing EPA Site/Spill ID Number 0737 shall be deposited in the Cherokee County Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Cherokee

County Superfund Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund. The total amount to be paid by Sunoco, Inc. pursuant to Subparagraph 53.a referencing EPA Site/Spill ID Number 0736 shall be deposited in the Jasper County Special Account within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Jasper County Superfund Site, or to be transferred by EPA to the EPA Hazardous Substance Superfund.

54. Payments for Future Response Costs.

a. Settling Defendants shall pay to EPA all Future Response Costs not inconsistent with the National Contingency Plan, except Settling Defendants are not required to pay Future Response Costs associated with SW-W4 Channel Work as identified in Appendix C2, unless such Future Response Costs are for a Work Takeover pursuant to Paragraph 87 of the SW-W4 Channel Work. Future Response Costs incurred by EPA shall be billed based on Settling Defendant-Specific Work to the extent possible, or if not possible, then apportioned as follows: E.I. du Pont de Nemours and Company–10% of total; NL Industries, Inc.–30% of total; and Sunoco, Inc.–60% of total. On a periodic basis the United States will send Settling Defendants a bill requiring payment that includes a Regionally-prepared cost summary, which includes direct and indirect costs incurred by EPA and its contractors, and a DOJ-prepared cost summary which reflects costs incurred by DOJ and its contractors, if any. Settling Defendants shall make all payments within sixty (60) days of Settling Defendants' receipt of each bill requiring payment, except as otherwise provided in Paragraph 55. Settling Defendants shall make all payments required by this Paragraph by a certified or cashier's check or checks made payable to "EPA Hazardous Substance Superfund," referencing the name and address of the

party making the payment, EPA Site/Spill ID Number Number 0737 for the Waco Kansas Site or 0736 for the Waco Missouri Site, as appropriate, and DOJ Case Number 90-11-2-08539. Settling Defendants shall send the check(s) to:

Mellon Bank, Attn: Superfund Accounting

EPA Region VII, Comptroller Branch

P.O. Box 360648M

Pittsburgh, PA 15251

b. At the time of payment, Settling Defendants shall send notice that payment has been made to the United States, to EPA and to the Regional Financial Management Officer, in accordance with Section XXVI (Notices and Submissions).

c. The total amount to be paid by Setting Defendants pursuant to Subparagraph 54.a shall be deposited in the Cherokee County Special Account for costs related to the Waco Kansas Site, or in the Jasper County Special Account for costs related to the Waco Missouri Site, within the EPA Hazardous Substance Superfund to be retained and used to conduct or finance response actions at or in connection with the Cherokee County Superfund Site or the Jasper County Superfund Site, as appropriate, or to be transferred by EPA to the EPA Hazardous Substance Superfund.

55. Settling Defendants may contest payment of any Future Response Costs under Paragraph 54 if they determine that the United States has made an accounting error or if they allege that a cost item that is included represents costs that are inconsistent with the NCP. Such

objection shall be made in writing within 30 days of receipt of the bill and must be sent to the United States pursuant to Section XXVI (Notices and Submissions). Any such objection shall specifically identify the contested Future Response Costs and the basis for objection. In the event of an objection, the Settling Defendants shall within the 30 day period pay all uncontested Future Response Costs to the United States in the manner described in Paragraph 54. Simultaneously, the Settling Defendants shall establish an interest-bearing escrow account in a federally-insured bank duly chartered in the State of Kansas for Waco Kansas Site costs and the State of Missouri for Waco Missouri Site costs and remit to that escrow account funds equivalent to the amount of the contested Future Response Costs. The Settling Defendants shall send to the United States, as provided in Section XXVI (Notices and Submissions), a copy of the transmittal letter and check paying the uncontested Future Response Costs, and a copy of the correspondence that establishes and funds the escrow account, including, but not limited to, information containing the identity of the bank and bank account under which the escrow account is established as well as a bank statement showing the initial balance of the escrow account. Simultaneously with establishment of the escrow account, the Settling Defendants shall initiate the Dispute Resolution procedures in Section XIX (Dispute Resolution). If the United States prevails in the dispute, within 5 days of the resolution of the dispute, the Settling Defendants shall pay the sums due (with accrued interest) to the United States in the manner described in Paragraph 54. If the Settling Defendants prevail concerning any aspect of the contested costs, the Settling Defendants shall pay that portion of the costs (plus associated accrued interest) for which they did not prevail to the United States in the manner described in Paragraph 54; Settling Defendants shall be disbursed any balance of the escrow account. The dispute resolution procedures set forth in this Paragraph in conjunction with the procedures set

forth in Section XIX (Dispute Resolution) shall be the exclusive mechanisms for resolving disputes regarding the Settling Defendants' obligation to reimburse the United States for its Future Response Costs.

56. In the event that the payments required by Subparagraph 53.a are not made within sixty (60) days of the Effective Date or the payments required by Paragraph 54 are not made within sixty (60) days of the Settling Defendants' receipt of the bill, Settling Defendants shall pay Interest on the unpaid balance. The Interest to be paid on Past Response Costs under this Paragraph shall begin to accrue on the Effective Date. The Interest on Future Response Costs shall begin to accrue on the date of the bill. The Interest shall accrue through the date of the Settling Defendants' payment. Payments of Interest made under this Paragraph shall be in addition to such other remedies or sanctions available to Plaintiff by virtue of Settling Defendants' failure to make timely payments under this Section including, but not limited to, payment of stipulated penalties pursuant to Paragraph 71. The Settling Defendants shall make all payments required by this Paragraph in the manner described in Paragraph 54.

XVII. INDEMNIFICATION AND INSURANCE

57. Settling Defendants' Indemnification of the United States.

a. The United States does not assume any liability by entering into this agreement or by virtue of any designation of Settling Defendants as EPA's authorized representatives under Section 104(e) of CERCLA. Settling Defendants shall indemnify, save and hold harmless the United States and its officials, agents, employees, contractors, subcontractors, or representatives for or from any and all claims or causes of action arising from,

or on account of, negligent or other wrongful acts or omissions of Settling Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Consent Decree, including, but not limited to, any claims arising from any designation of Settling Defendants as EPA's authorized representatives under Section 104(e) of CERCLA. Further, the Settling Defendants agree to pay the United States all costs it incurs including, but not limited to, attorneys fees and other expenses of litigation and settlement arising from, or on account of, claims made against the United States based on negligent or other wrongful acts or omissions of Settling Defendants, their officers, directors, employees, agents, contractors, subcontractors, and any persons acting on their behalf or under their control, in carrying out activities pursuant to this Consent Decree. The United States shall not be held out as a party to any contract entered into by or on behalf of Settling Defendants in carrying out activities pursuant to this Consent Decree. Neither the Settling Defendants nor any such contractor shall be considered an agent of the United States.

b. The United States shall give Settling Defendants notice of any claim for which the United States plans to seek indemnification pursuant to Paragraph 57, and shall consult with Settling Defendants prior to settling such claim.

58. Settling Defendants waive all claims against the United States for damages or reimbursement or for set-off of any payments made or to be made to the United States, arising from or on account of any contract, agreement, or arrangement between any one or more of Settling Defendants and any person for performance of Work on or relating to the Waco Missouri Site or the Waco Kansas Site, including, but not limited to, claims on account of

construction delays. In addition, Settling Defendants shall indemnify and hold harmless the United States with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between any one or more of Settling Defendants and any person for performance of Work on or relating to the Waco Missouri Site or the Waco Kansas Site, including, but not limited to, claims on account of construction delays.

59. No later than 15 days before commencing any on-site Work, Settling Defendants shall secure, and shall maintain until the first anniversary of EPA's Certification of Completion of the Remedial Action pursuant to Subparagraph 49.b of Section XIV (Certification of Completion) comprehensive general liability insurance with limits of $5.0 million dollars, combined single limit, and automobile liability insurance with limits of $2.0 million dollars, combined single limit, naming the United States as an additional insured. In addition, for the duration of this Consent Decree, Settling Defendants shall satisfy, or shall ensure that their contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of worker's compensation insurance for all persons performing the Work on behalf of Settling Defendants in furtherance of this Consent Decree. Prior to commencement of the Work under this Consent Decree, Settling Defendants shall provide to EPA certificates of such insurance and a copy of each insurance policy. Settling Defendants shall resubmit such certificates and copies of policies each year on the anniversary of the Effective Date. If Settling Defendants demonstrate by evidence satisfactory to EPA that any contractor or subcontractor maintains insurance equivalent to that described above, or insurance covering the same risks but in a lesser amount, then, with respect to that contractor or subcontractor, Settling Defendants need provide only that portion of the insurance described above which is not maintained by the contractor or subcontractor.

XVIII. FORCE MAJEURE

60. "Force Majeure," for purposes of this Consent Decree, is defined as any event arising from causes beyond the control of the Settling Defendants, of any entity controlled by Settling Defendants, or of Settling Defendants' contractors, that delays or prevents the performance of any obligation under this Consent Decree despite Settling Defendants' best efforts to fulfill the obligation. The requirement that the Settling Defendants exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential Force Majeure event and best efforts to address the effects of any potential Force Majeure event (1) as it is occurring and (2) following the potential Force Majeure event, such that the delay is minimized to the greatest extent possible. "Force Majeure" does not include financial inability to complete the Work or a failure to attain the Performance Standards.

61. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree, whether or not caused by a Force Majeure event, the Settling Defendants shall notify orally EPA's Project Coordinator or, in his or her absence, EPA's Alternate Project Coordinator or, in the event both of EPA's designated representatives are unavailable, the Director of the Superfund Division, EPA Region VII, within 3 days of when Settling Defendants first knew that the event might cause a delay. Within 7 days thereafter, Settling Defendants shall provide in writing to EPA an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; the Settling Defendants' rationale for attributing such delay to a Force Majeure event if they intend to assert such a claim; and a

statement as to whether, in the opinion of the Settling Defendants, such event may cause or contribute to an endangerment to public health, welfare or the environment. The Settling Defendants shall include with any notice all available documentation supporting their claim that the delay was attributable to a Force Majeure. Failure to comply with the above requirements shall preclude Settling Defendants from asserting any claim of Force Majeure for that event for the period of time of such failure to comply, and for any additional delay caused by such failure. Settling Defendants shall be deemed to know of any circumstance of which Settling Defendants, any entity controlled by Settling Defendants, or Settling Defendants' contractors knew or should have known.

62. If EPA agrees that the delay or anticipated delay is attributable to a Force Majeure event, the time for performance of the obligations under this Consent Decree that are affected by the Force Majeure event will be extended by EPA for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the Force Majeure event shall not, of itself, extend the time for performance of any other obligation. If EPA does not agree that the delay or anticipated delay has been or will be caused by a Force Majeure event, EPA will notify the Settling Defendants in writing of its decision. If EPA agrees that the delay is attributable to a Force Majeure event, EPA will notify the Settling Defendants in writing of the length of the extension, if any, for performance of the obligations affected by the Force Majeure event.

63. If the Settling Defendants elect to invoke the dispute resolution procedures set forth in Section XIX (Dispute Resolution), they shall do so no later than 15 days after receipt of EPA's notice. In any such proceeding, Settling Defendants shall have the burden of

demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a Force Majeure event, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Settling Defendants complied with the requirements of Paragraphs 60 and 61, above. If Settling Defendants carry this burden, the delay at issue shall be deemed not to be a violation by Settling Defendants of the affected obligation of this Consent Decree identified to EPA and the Court.

XIX. DISPUTE RESOLUTION

64. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under or with respect to this Consent Decree. However, the procedures set forth in this Section shall not apply to actions by the United States to enforce obligations of the Settling Defendants that have not been disputed in accordance with this Section.

65. Any dispute which arises under or with respect to this Consent Decree shall in the first instance be the subject of informal negotiations between the parties to the dispute. The period for informal negotiations shall not exceed 20 days from the time the dispute arises, unless it is modified by written agreement of the parties to the dispute. The dispute shall be considered to have arisen when one party sends the other parties a written Notice of Dispute.

66. Statements of Position.

a. In the event that the parties cannot resolve a dispute by informal negotiations under the preceding Paragraph, then the position advanced by EPA shall be considered binding unless, within 30 days after the conclusion of the informal negotiation period, Settling Defendants invoke the formal dispute resolution procedures of this Section by serving on the United States a written Statement of Position on the matter in dispute, including, but not limited to, any factual data, analysis or opinion supporting that position and any supporting documentation relied upon by the Settling Defendants. The Statement of Position shall specify the Settling Defendants' position as to whether formal dispute resolution should proceed under Paragraph 67 or Paragraph 68.

b. Within 30 days after receipt of Settling Defendants' Statement of Position, EPA will serve on Settling Defendants its Statement of Position, including, but not limited to, any factual data, analysis, or opinion supporting that position and all supporting documentation relied upon by EPA. EPA's Statement of Position shall include a statement as to whether formal dispute resolution should proceed under Paragraph 67 or 68. Within 20 days after receipt of EPA's Statement of Position, Settling Defendants may submit a Reply.

c. If there is disagreement between EPA and the Settling Defendants as to whether dispute resolution should proceed under Paragraph 67 or 68, the parties to the dispute shall follow the procedures set forth in the paragraph determined by EPA to be applicable. However, if the Settling Defendants ultimately appeal to the Court to resolve the dispute, the Court shall determine which paragraph is applicable in accordance with the standards of applicability set forth in Paragraphs 67 and 68.

67. Formal dispute resolution for disputes pertaining to the selection or adequacy of any response action and all other disputes that are accorded review on the administrative record under applicable principles of administrative law shall be conducted pursuant to the procedures set forth in this Paragraph. For purposes of this Paragraph, the adequacy of any response action includes, without limitation: (1) the adequacy or appropriateness of plans, procedures to implement plans, or any other items requiring approval by EPA under this Consent Decree; and (2) the adequacy of the performance of response actions taken pursuant to this Consent Decree. Nothing in this Consent Decree shall be construed to allow any dispute by Settling Defendants regarding the validity of the ROD's provisions.

a. An administrative record of the dispute shall be maintained by EPA and shall contain all statements of position, including supporting documentation, submitted pursuant to this Section. Where appropriate, EPA may allow submission of supplemental statements of position by the parties to the dispute.

b. The Director of the Superfund Division, EPA Region VII, will issue a final administrative decision resolving the dispute based on the administrative record described in Paragraph 67.a. This decision shall be binding upon the Settling Defendants, subject only to the right to seek judicial review pursuant to Paragraph 67.c and d.

c. Any administrative decision made by EPA pursuant to Paragraph 67.b. shall be reviewable by this Court, provided that a motion for judicial review of the decision is filed by the Settling Defendants with the Court and served on all Parties within 10 days of receipt of EPA's decision. The motion shall include a description of the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within

which the dispute must be resolved to ensure orderly implementation of this Consent Decree. The United States may file a response to Settling Defendants' motion.

d. In proceedings on any dispute governed by this Paragraph, Settling Defendants shall have the burden of demonstrating that the decision of the Superfund Division Director is arbitrary and capricious or otherwise not in accordance with law. Judicial review of EPA's decision shall be on the administrative record compiled pursuant to Paragraph 67.a.

68. Formal dispute resolution for disputes that neither pertain to the selection or adequacy of any response action nor are otherwise accorded review on the administrative record under applicable principles of administrative law, shall be governed by this Paragraph.

a. Following receipt of Settling Defendants' Statement of Position submitted pursuant to Paragraph 66, the Director of the Superfund Division, EPA Region VII, will issue a final decision resolving the dispute. The Superfund Division Director's decision shall be binding on the Settling Defendants unless, within 10 days of receipt of the decision, the Settling Defendants file with the Court and serve on the parties a motion for judicial review of the decision setting forth the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of the Consent Decree. The United States may file a response to Settling Defendants' motion.

b. Notwithstanding Paragraph M of Section I (Background) of this Consent Decree, judicial review of any dispute governed by this Paragraph shall be governed by applicable principles of law.

69. The invocation of formal dispute resolution procedures under this Section shall not extend, postpone or affect in any way any obligation of the Settling Defendants under this Consent Decree, not directly in dispute, unless EPA or the Court agrees otherwise. Stipulated penalties with respect to the disputed matter shall continue to accrue but payment shall be stayed pending resolution of the dispute as provided in Paragraph 78. Notwithstanding the stay of payment, stipulated penalties shall accrue from the first day of noncompliance with any applicable provision of this Consent Decree. In the event that the Settling Defendants do not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section XX (Stipulated Penalties).

XX. STIPULATED PENALTIES

70. Settling Defendants shall be liable for stipulated penalties in the amounts set forth in Paragraphs 71 and 72 to the United States for failure to comply with the specific requirements attributable to the individual Settling Defendant under this Consent Decree specified below, unless excused under Section XVIII (Force Majeure). "Compliance" by each Settling Defendant shall include completion of the activities under this Consent Decree or any work plan or other plan approved under this Consent Decree identified below in accordance with all applicable requirements of law, this Consent Decree, the SOW, and any plans or other documents approved by EPA pursuant to this Consent Decree and within the specified time schedules established by and approved under this Consent Decree.

71. Stipulated Penalty Amounts - Work.

a. The following stipulated penalties shall accrue per violation per day for any noncompliance identified in Subparagraph 71.b:

Penalty Per Violation Per Day	Period of Noncompliance
$ 500	1st through 14th day
$ 1,000	15th through 30th day
$ 1,500	31st day and beyond

b. Compliance Milestones.

(1) Payment of Past Response Costs as directed in this Consent Decree.

(2) Payment of Future Response Costs as directed in this Consent Decree.

(3) Submission of the Remedial Design Work Plan in accordance with the schedule developed under this Consent Decree.

(4) Submission of the 100% Remedial Design Submittal package in accordance with the schedule developed under this Consent Decree.

(5) Submission of the Remedial Action Work Plan in accordance with the schedule developed under this Consent Decree.

(6) Beginning implementation of the Remedial Action in accordance with the schedule developed under this Consent Decree.

(7) Completing implementation of the Remedial Action in accordance with the schedule developed under this Consent Decree.

72. Stipulated Penalty Amounts - Reports.

a. The following stipulated penalties shall accrue per violation per day for failure to submit timely or adequate reports pursuant to Section X. (Reporting Requirements):

Penalty Per Violation Per Day	Period of Noncompliance
$ 100	1st through 14th day
$ 500	15th through 30th day
$ 1,000	31st day and beyond

73. In the event that EPA assumes performance of a portion or all of the Settling Defendant-Specific Work pursuant to Paragraph 87 of Section XXI (Covenants Not to Sue by Plaintiff), each Settling Defendant whose Settling Defendant-Specific Work has been taken over shall be liable for a stipulated penalty in the amount of $100,000.

74. All penalties shall begin to accrue on the day after the complete performance is due or the day a violation occurs, and shall continue to accrue through the final day of the correction of the noncompliance or completion of the activity. However, stipulated penalties shall not accrue: (1) with respect to a deficient submission under Section XI (EPA Approval of Plans and Other Submissions), during the period, if any, beginning on the 31st day after EPA's receipt of such submission until the date that EPA notifies Settling Defendants of any deficiency; (2) with respect to a decision by the Director of the Superfund Division, EPA Region VII, under

Paragraph 67.b or 68.a of Section XIX (Dispute Resolution), during the period, if any, beginning on the 21st day after the date that Settling Defendants' reply to EPA's Statement of Position is received until the date that the Director issues a final decision regarding such dispute; or (3) with respect to judicial review by this Court of any dispute under Section XIX (Dispute Resolution), during the period, if any, beginning on the 31st day after the Court's receipt of the final submission regarding the dispute until the date that the Court issues a final decision regarding such dispute. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Consent Decree.

75. Following EPA's determination that Settling Defendants have failed to comply with a requirement of this Consent Decree, EPA may give Settling Defendants written notification of the same and describe the noncompliance. EPA may send the Settling Defendants a written demand for the payment of the penalties. However, penalties shall accrue as provided in the preceding Paragraph regardless of whether EPA has notified the Settling Defendants of a violation.

76. All penalties accruing under this Section shall be due and payable to the United States within sixty (60) days of the Settling Defendants' receipt from EPA of a demand for payment of the penalties, unless Settling Defendants invoke the Dispute Resolution procedures under Section XIX (Dispute Resolution). All payments to the United States under this Section shall be paid by certified or cashier's check(s) made payable to “EPA Hazardous Substances Superfund,” shall be mailed to:

Mellon Bank, Attn: Superfund Accounting

EPA Region VII, Comptroller Branch

P.O. Box 360648M

Pittsburgh, PA 15251

and shall indicate that the payment is for stipulated penalties, and shall reference the EPA Site/Spill ID Number Number 0737 for the Waco Kansas Site or 0736 for the Waco Missouri Site, as appropriate, and DOJ Case Number 90-11-2-08539, and the name and address of the party making payment. Copies of check(s) paid pursuant to this Section, and any accompanying transmittal letter(s), shall be sent to the United States as provided in Section XXVI (Notices and Submissions).

77. The payment of penalties shall not alter in any way Settling Defendants' obligation to complete the performance of the Work required under this Consent Decree.

78. Penalties shall continue to accrue as provided in Paragraph 74 during any dispute resolution period, but need not be paid until the following:

a. If the dispute is resolved by agreement or by a decision of EPA that is not appealed to this Court, accrued penalties determined to be owing shall be paid to EPA within 15 days of the agreement or the receipt of EPA's decision or order;

b. If the dispute is appealed to this Court and the United States prevails in whole or in part, Settling Defendants shall pay all accrued penalties determined by the Court to

be owed to EPA within 60 days of receipt of the Court's decision or order, except as provided in Subparagraph c below;

c. If the District Court's decision is appealed by any Party, Settling Defendants shall pay all accrued penalties determined by the District Court to be owing to the United States into an interest-bearing escrow account within 60 days of receipt of the Court's decision or order. Penalties shall be paid into this account as they continue to accrue, at least every 60 days. Within 15 days of receipt of the final appellate court decision, the escrow agent shall pay the balance of the account to EPA or to Settling Defendants to the extent that they prevail.

79. If Settling Defendants fail to pay stipulated penalties when due, the United States may institute proceedings to collect the penalties, as well as interest. Settling Defendants shall pay Interest on the unpaid balance, which shall begin to accrue on the date of demand made pursuant to Paragraph 76.

80. Nothing in this Consent Decree shall be construed as prohibiting, altering, or in any way limiting the ability of the United States to seek any other remedies or sanctions available by virtue of Settling Defendants' violation of this Decree or of the statutes and regulations upon which it is based, including, but not limited to, penalties pursuant to Section 122(l) of CERCLA, provided, however, that the United States shall not seek civil penalties pursuant to Section 122(l) of CERCLA for any violation for which a stipulated penalty is provided herein, except in the case of a willful violation of the Consent Decree.

81. Notwithstanding any other provision of this Section, the United States may, in its unreviewable discretion, waive any portion of stipulated penalties that have accrued pursuant to this Consent Decree.

XXI. COVENANTS NOT TO SUE BY PLAINTIFF

82. In consideration of the actions that will be performed and the payments that will be made by the Settling Defendants under the terms of the Consent Decree, and except as specifically provided in Paragraphs 83, 84, and 86 of this Section, the United States covenants not to sue or to take administrative action against Settling Defendants pursuant to Sections 106 and 107(a) of CERCLA and Section 7003 of RCRA relating to the specific areas within the Waco Subsite of the Cherokee County, Kansas Superfund Site or within the Waco Designated Area or Waco Tributary of the Jasper County, Missouri Superfund Site, for which each Settling Defendant is designated as the party performing its respective Settling Defendant-Specific Work, as depicted in the map and accompanying legend attached as Appendix C2. Except with respect to future liability, these covenants not to sue shall take effect upon the receipt by EPA of the payments required by Paragraph 53.a of Section XVI (Payments for Response Costs). With respect to future liability, these covenants not to sue shall take effect upon Certification of Completion of Remedial Action by EPA pursuant to Paragraph 49.b of Section XIV (Certification of Completion). These covenants not to sue are conditioned upon the satisfactory performance by Settling Defendants of their obligations under this Consent Decree. These covenants not to sue extend only to the Settling Defendants and do not extend to any other person.

83. United States' Pre-certification Reservations. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendants

a. to perform further response actions relating to the Waco Kansas Site or the Waco Missouri Site, or

b. to reimburse the United States for additional costs of response if, prior to Certification of Completion of the Remedial Action:

(1) conditions at the Waco Kansas Site or the Waco Missouri Site, previously unknown to EPA, are discovered, or

(2) information, previously unknown to EPA, is received, in whole or in part,

and EPA determines that these previously unknown conditions or information together with any other relevant information indicates that the Remedial Action is not protective of human health or the environment.

84. United States' Post-certification Reservations. Notwithstanding any other provision of this Consent Decree, the United States reserves, and this Consent Decree is without prejudice to, the right to institute proceedings in this action or in a new action, or to issue an administrative order seeking to compel Settling Defendants

a. to perform further response actions relating to the Waco Kansas Site or the Waco Missouri Site, or

b. to reimburse the United States for additional costs of response if, subsequent to Certification of Completion of the Remedial Action:

(1) conditions at the Waco Kansas Site or the Waco Missouri Site, previously unknown to EPA, are discovered, or

(2) information, previously unknown to EPA, is received, in whole or in part,

and EPA determines that these previously unknown conditions or this information together with other relevant information indicate that the Remedial Action is not protective of human health or the environment.

85. For purposes of Paragraph 83, the information and the conditions known to EPA shall include only that information and those conditions known to EPA as of the date the RODs were signed and set forth in the Record of Decisions for the Waco Kansas Site or the Waco Missouri Site and the administrative record supporting the Record of Decisions. For purposes of Paragraph 84, the information and the conditions known to EPA shall include only that information and those conditions known to EPA as of the date of Certification of Completion of the Remedial Action and set forth in the Record of Decisions, the administrative records supporting the Record of Decisions, the post-ROD administrative records, or in any information received by EPA pursuant to the requirements of this Consent Decree prior to Certification of Completion of the Remedial Action.

86. General reservations of rights. The United States reserves, and this Consent Decree is without prejudice to, all rights against Settling Defendants with respect to all matters not expressly included within Plaintiff's covenant not to sue. Notwithstanding any other provision of this Consent Decree, the United States reserves all rights against Settling Defendants with respect to:

a. claims based on a failure by Settling Defendants to meet a requirement of this Consent Decree;

b. liability arising from the past, present, or future disposal, release, or threat of release of Waste Material outside of the Waco Kansas Site or the Waco Missouri Site;

c. liability based upon the Settling Defendants' ownership or operation of the Waco Kansas Site or the Waco Missouri Site, or upon the Settling Defendants' transportation, treatment, storage, or disposal, or the arrangement for the transportation, treatment, storage, or disposal of Waste Material at or in connection with the Waco Kansas Site or the Waco Missouri Site, other than as provided in the RODs, the Work, or otherwise ordered by EPA, after signature of this Consent Decree by the Settling Defendants;

d. liability for damages for injury to, destruction of, or loss of natural resources, and for the costs of any natural resource damage assessments;

e. criminal liability;

f. liability for violations of federal or state law which occur during or after implementation of the Remedial Action; and

g. liability, prior to Certification of Completion of the Remedial Action, for additional response actions that EPA determines are necessary to achieve Performance Standards, but that cannot be required pursuant to Paragraph 13 (Modification of the SOW or Related Work Plans).

87. Work Takeover In the event EPA determines that one or more of the Settling Defendants has ceased implementation of any portion of the Settling Defendant-Specific Work, is seriously or repeatedly deficient or late in their performance of the Settling Defendant-Specific Work, or is implementing the Settling Defendant-Specific Work in a manner which may cause an endangerment to human health or the environment, EPA may assume the performance of all or any portions of the Settling Defendant-Specific Work as EPA determines necessary. A Settling Defendant may invoke the procedures set forth in Section XIX (Dispute Resolution), Paragraph 67, to dispute EPA's determination that takeover of that Settling Defendant's Settling Defendant-SpecificWork is warranted under this Paragraph. Costs incurred by the United States in performing the Settling Defendant-Specific Work pursuant to this Paragraph shall be considered Future Response Costs that the Settling Defendant whose Settling Defendant-Specific Work has been taken over shall pay pursuant to Section XVI (Payment for Response Costs).

88. Notwithstanding any other provision of this Consent Decree, the United States and the State retain all authority and reserve all rights to take any and all response actions authorized by law.

XXII. COVENANTS BY SETTLING DEFENDANTS

89. Covenant Not to Sue. Subject to the reservations in Paragraph 90, Settling Defendants hereby covenant not to sue and agree not to assert any claims or causes of action against the United States with respect to the Waco Kansas Site or the Waco Missouri Site, Past and Future Response Costs as defined herein, or this Consent Decree, including, but not limited to:

a. any direct or indirect claim for reimbursement from the Hazardous Substance Superfund (established pursuant to the Internal Revenue Code, 26 U.S.C. § 9507) through CERCLA Sections 106(b)(2), 107, 111, 112, 113 or any other provision of law;

b. any claims against the United States, including any department, agency or instrumentality of the United States under CERCLA Sections 107 or 113 related to the Waco Kansas Site or the Waco Missouri Site, or

c. any claims arising out of response actions at or in connection with the Waco Kansas Site or the Waco Missouri Site, including any claim under the United States Constitution, the Kansas Constitution, the Tucker Act, 28 U.S.C. § 1491, the Equal Access to Justice Act, 28 U.S.C. § 2412, as amended, or at common law.

d. any direct or indirect claim for disbursement from the Cherokee County OU-6 Special Account or any other Special Accounts related to the Cherokee County Superfund Site or the Jasper County Superfund Site.

Except as provided in Paragraph 92 (Waiver of Claims Against De Micromis Parties), and Paragraph 97 (waiver of Claim-Splitting Defenses), these covenants not to sue shall not apply in the event that the United States brings a cause of action or issues an order pursuant to

the reservations set forth in Paragraphs 83, 84, 86(b) - (d) or 86(g), but only to the extent that Settling Defendants' claims arise from the same response action, response costs, or damages that the United States is seeking pursuant to the applicable reservation.

90. The Settling Defendants reserve, and this Consent Decree is without prejudice to, claims against the United States, subject to the provisions of Chapter 171 of Title 28 of the United States Code, for money damages for injury or loss of property or personal injury or death caused by the negligent or wrongful act or omission of any employee of the United States while acting within the scope of his office or employment under circumstances where the United States, if a private person, would be liable to the claimant in accordance with the law of the place where the act or omission occurred. However, any such claim shall not include a claim for any damages caused, in whole or in part, by the act or omission of any person, including any contractor, who is not a federal employee as that term is defined in 28 U.S.C. § 2671; nor shall any such claim include a claim based on EPA's selection of response actions, or the oversight or approval of the Settling Defendants' plans or activities. The foregoing applies only to claims which are brought pursuant to any statute other than CERCLA and for which the waiver of sovereign immunity is found in a statute other than CERCLA.

91. Nothing in this Consent Decree shall be deemed to constitute preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.700(d).

92. Settling Defendants agree not to assert any claims and to waive all claims or causes of action that they may have for all matters relating to the Waco Kansas Site or the Waco Missouri Site, including for contribution, against any person where the person's liability to

Settling Defendants with respect to the Waco Kansas Site or the Waco Missouri Site is based solely on having arranged for disposal or treatment, or for transport for disposal or treatment, of hazardous substances at the Waco Kansas Site or the Waco Missouri Site, or having accepted for transport for disposal or treatment of hazardous substances at the Waco Kansas Site or the Waco Missouri Site, if:

a. the materials contributed by such person to the Waco Kansas Site or the Waco Missouri Site containing hazardous substances did not exceed the greater of (i) 0.002% of the total volume of waste at the Waco Kansas Site or the Waco Missouri Site, or (ii) 110 gallons of liquid materials or 200 pounds of solid materials.

b. This waiver shall not apply to any claim or cause of action against any person meeting the above criteria if EPA has determined that the materials contributed to the Waco Kansas Site or the Waco Missouri Site by such person contributed or could contribute significantly to the costs of response at the Waco Kansas Site or the Waco Missouri Site. This waiver also shall not apply with respect to any defense, claim, or cause of action that a Settling Defendant may have against any person if such person asserts a claim or cause of action relating to the Waco Kansas Site or the Waco Missouri Site against such Settling Defendant.

XXIII. EFFECT OF SETTLEMENT; CONTRIBUTION PROTECTION

93. Except as provided in Paragraph 92 (Waiver of Claims Against De Micromis Parties), nothing in this Consent Decree shall be construed to create any rights in, or grant any cause of action to, any person not a Party to this Consent Decree. The preceding sentence shall not be construed to waive or nullify any rights that any person not a signatory to this decree may have under applicable law. Except as provided in Paragraph 92 (Waiver of Claims Against De Micromis Parties), each of the Parties expressly reserves any and all rights (including, but not limited to, any right to contribution), defenses, claims, demands, and causes of action which each Party may have with respect to any matter, transaction, or occurrence relating in any way to the Site against any person not a Party hereto.

94. The Parties agree, and by entering this Consent Decree this Court finds, that the Settling Defendants are entitled, as of the Effective Date, to protection from contribution actions or claims as provided by CERCLA Section 113(f)(2), 42 U.S.C. § 9613(f)(2) for matters addressed in this Consent Decree. "Matters addressed" means response actions pursuant to this Consent Decree and the Waco Subsite as contained within the ROD for OU-6 for the Cherokee County, Kansas Superfund Site, and means response actions pursuant to this Consent Decree and the Waco Designated Area and Waco Tributary as contained within the ROD for OU-1 for the Jasper County, Missouri Superfund Site.

95. The Settling Defendants agree that with respect to any suit or claim for contribution brought by them for matters related to this Consent Decree they will notify the United States in writing no later than 60 days prior to the initiation of such suit or claim.

96. The Settling Defendants also agree that with respect to any suit or claim for contribution brought against them for matters related to this Consent Decree they will notify in writing the United States within 10 days of service of the complaint on them. In addition, Settling Defendants shall notify the United States within 10 days of service or receipt of any Motion for Summary Judgment and within 10 days of receipt of any order from a court setting a case for trial.

97. In any subsequent administrative or judicial proceeding initiated by the United States for injunctive relief, recovery of response costs, or other appropriate relief relating to the Waco Missouri Site or the Waco Kansas Site, Settling Defendants shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States in the subsequent proceeding were or should have been brought in the instant case; provided, however, that nothing in this Paragraph affects the enforceability of the covenants not to sue set forth in Section XXI (Covenants Not to Sue by Plaintiff).

XXIV. ACCESS TO INFORMATION

98. Settling Defendants shall provide to EPA, upon request, copies of all documents and information within their possession or control or that of their contractors or agents relating to activities at the Waco Missouri Site or the Waco Kansas Site or to the implementation of this Consent Decree, including, but not limited to, sampling, analysis, chain of custody records, manifests, trucking logs, receipts, reports, sample traffic routing, correspondence, or other documents or information related to the Work. Settling Defendants shall also make available to

EPA, for purposes of investigation, information gathering, or testimony, their employees, agents, or representatives with knowledge of relevant facts concerning the performance of the Work.

99. Business Confidential and Privileged Documents.

a. Settling Defendants may assert business confidentiality claims covering part or all of the documents or information submitted to Plaintiff under this Consent Decree to the extent permitted by and in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. § 2.203(b). Documents or information determined to be confidential by EPA will be afforded the protection specified in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality accompanies documents or information when they are submitted to EPA, or if EPA has notified Settling Defendants that the documents or information are not confidential under the standards of Section 104(e)(7) of CERCLA or 40 C.F.R. Part 2, Subpart B, the public may be given access to such documents or information without further notice to Settling Defendants.

b. The Settling Defendants may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Settling Defendants assert such a privilege in lieu of providing documents, they shall provide the Plaintiff with the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the contents of the document, record, or information: and (6) the privilege asserted by Settling Defendants. However, no documents, reports or other

information created or generated pursuant to the requirements of the Consent Decree shall be withheld on the grounds that they are privileged.

100. No claim of confidentiality shall be made with respect to any data, including, but not limited to, all sampling, analytical, monitoring, hydrogeologic, scientific, chemical, or engineering data, or any other documents or information evidencing conditions at or around the Waco Missouri Site or the Waco Kansas Site.

XXV. RETENTION OF RECORDS

101. Until 10 years after the Settling Defendants' receipt of EPA's notification pursuant to Paragraph 50.b of Section XIV (Certification of Completion of the Work), each Settling Defendant shall preserve and retain all non-identical copies of records and documents (including records or documents in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to its liability under CERCLA with respect to the Waco Missouri Site or the Waco Kansas Site, provided, however, that Settling Defendants who are potentially liable as owners or operators of the Waco Missouri Site or the Waco Kansas Site must retain, in addition, all documents and records that relate to the liability of any other person under CERCLA with respect to the Waco Missouri Site or the Waco Kansas Site. Each Settling Defendant must also retain, and instruct its contractors and agents to preserve, for the same period of time specified above all non-identical copies of the last draft or final version of any documents or records (including documents or records in electronic form) now in its possession or control or which come into its possession or control that relate in any manner to the performance of the Work, provided, however, that each Settling Defendant (and its contractors and agents) must retain, in addition, copies of all data generated during the performance of the

Work and not contained in the aforementioned documents required to be retained. Each of the above record retention requirements shall apply regardless of any corporate retention policy to the contrary.

102. At the conclusion of this document retention period, Settling Defendants shall notify the United States at least 90 days prior to the destruction of any such records or documents, and, upon request by the United States, Settling Defendants shall deliver any such records or documents to EPA. The Settling Defendants may assert that certain documents, records and other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Settling Defendants assert such a privilege, they shall provide the Plaintiffs with the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of the author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the subject of the document, record, or information; and (6) the privilege asserted by Settling Defendants. However, no documents, reports or other information created or generated pursuant to the requirements of the Consent Decree shall be withheld on the grounds that they are privileged.

103. Each Settling Defendant hereby certifies individually that, to the best of its knowledge and belief, after thorough inquiry, it has not altered, mutilated, discarded, destroyed or otherwise disposed of any records, documents or other information (other than identical copies) relating to its potential liability regarding the Waco Missouri Site or the Waco Kansas Site since notification of potential liability by the United States or the State or the filing of suit against it regarding the Waco Missouri Site or the Waco Kansas Site and that it has fully

complied with any and all EPA requests for information pursuant to Section 104(e) and 122(e) of CERCLA, 42 U.S.C. 9604(e) and 9622(e), and Section 3007 of RCRA, 42 U.S.C. 6927.

XXVI. NOTICES AND SUBMISSIONS

104. Whenever, under the terms of this Consent Decree, written notice is required to be given or a report or other document is required to be sent by one Party to another, it shall be directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. All notices and submissions shall be considered effective upon receipt, unless otherwise provided. Written notice as specified herein shall constitute complete satisfaction of any written notice requirement of the Consent Decree with respect to the United States, EPA, and the Settling Defendants, respectively.

As to the United States:

Section Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Re: DJ # 90-11-2-08539

As to EPA:

David Drake

EPA Project Coordinator

United States Environmental Protection Agency

Region VII

As to the Regional

Financial Management Officer: Betty Saladin

Financial Management Officer

United States Environmental Protection Agency

Region VII

As to the Settling Defendants: Dave Hinrichs

NewFields, Inc.

730 17th Street, Suite 925

Denver, CO 80202-3598

XXVIII. EFFECTIVE DATE

105. The effective date of this Consent Decree shall be the date upon which this Consent Decree is entered by the Court, except as otherwise provided herein.

XXIX. RETENTION OF JURISDICTION

106. This Court retains jurisdiction over both the subject matter of this Consent Decree and the Settling Defendants for the duration of the performance of the terms and provisions of this Consent Decree for the purpose of enabling any of the Parties to apply to the Court at any

time for such further order, direction, and relief as may be necessary or appropriate for the construction or modification of this Consent Decree, or to effectuate or enforce compliance with its terms, or to resolve disputes in accordance with Section XIX (Dispute Resolution) hereof.

XXX. APPENDICES

107. The following appendices are attached to and incorporated into this Consent Decree:

"Appendix A1" is the ROD for Cherokee County OU-6.

"Appendix A2" is the ROD for Jasper County OU-1.

"Appendix B1" is the Remedial Design SOW for the Waco Kansas Site.

"Appendix B2" is the Remedial Action SOW for the Waco Kansas Site.

"Appendix B3" is the Remedial Design and Remedial Action SOW for Sunoco, Inc., for portions of the Waco Kansas Site and Waco Missouri Site.

"Appendix C1" is the description and/or map of the Waco Kansas Site and Waco Missouri Site Work Areas.

"Appendix C2" is the description of the Site describing Settling Defendant-Specific Areas of Work.

XXXI. Community Relations

108. Settling Defendants shall propose to EPA their participation in the community relations plan to be developed by EPA. EPA will determine the appropriate role for the Settling Defendants under the Plan. Settling Defendants shall also cooperate with EPA and the State in providing information regarding the Work to the public. As requested by EPA, Settling Defendants shall participate in the preparation of such information for dissemination to the public and in public meetings which may be held or sponsored by EPA to explain activities at or relating to the Waco Missouri Site or the Waco Kansas Site.

XXXII. MODIFICATION

109. Schedules specified in this Consent Decree for completion of the Work may be modified by agreement of EPA and the Settling Defendants. All such modifications shall be made in writing.

110. Except as provided in Paragraph 13 (Modification of the SOW or Related Work Plans), no material modifications shall be made to the SOW without written notification to and written approval of the United States, Settling Defendants, and the Court, if such modifications fundamentally alter the basic features of the selected remedy within the meaning of 40 C.F.R. 300.435(c)(2)(B)(ii). Prior to providing its approval to any modification, the United States will provide the State with a reasonable opportunity to review and comment on the proposed modification. Modifications to the SOW that do not materially alter that document, or material modifications to the SOW that do not fundamentally alter the basic features of the selected remedy within the meaning of 40 C.F.R.300.435(c)(2)(B)(ii), may be made by written agreement

between EPA, after providing the State with a reasonable opportunity to review and comment on the proposed modification, and the Settling Defendants.

111. Nothing in this Decree shall be deemed to alter the Court's power to enforce, supervise or approve modifications to this Consent Decree.

XXXIII. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

112. This Consent Decree shall be lodged with the Court for a period of not less than thirty (30) days for public notice and comment in accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations which indicate that the Consent Decree is inappropriate, improper, or inadequate. Settling Defendants consent to the entry of this Consent Decree without further notice.

113. If for any reason the Court should decline to approve this Consent Decree in the form presented, this agreement is voidable at the sole discretion of any Party and the terms of the agreement may not be used as evidence in any litigation between the Parties.

XXXIV. SIGNATORIES/SERVICE

114. Each undersigned representative of a Settling Defendant to this Consent Decree and the Assistant Attorney General for the Environment and Natural Resources Division of the Department of Justice certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind such Party to this document.

115. Each Settling Defendant hereby agrees not to oppose entry of this Consent Decree by this Court or to challenge any provision of this Consent Decree unless the United States has notified the Settling Defendants in writing that it no longer supports entry of the Consent Decree.

116. Each Settling Defendant shall identify, on the attached signature page, the name, address and telephone number of an agent who is authorized to accept service of process by mail on behalf of that Party with respect to all matters arising under or relating to this Consent Decree. Settling Defendants hereby agree to accept service in that manner and to waive the formal service requirements set forth in Rule 4 of the Federal Rules of Civil Procedure and any applicable local rules of this Court, including, but not limited to, service of a summons. The parties agree that Settling Defendants need not file an answer to the complaint in this action unless or until the court expressly declines to enter this Consent Decree.

XXXV. FINAL JUDGMENT

117. This Consent Decree and its appendices constitute the final, complete, and exclusive agreement and understanding among the parties with respect to the settlement embodied in the Consent Decree. The parties acknowledge that there are no representations, agreements or understandings relating to the settlement other than those expressly contained in this Consent Decree.

118. Upon approval and entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment between and among the United States and the Settling Defendants. The Court finds that there is no just reason for delay and therefore enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

SO ORDERED THIS __ DAY OF _____, 20__.

_____

United States District Judge

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. E.I. du Pont de Nemours and Company; NL Industries, Inc.; and Sunoco, Inc., relating to the Waco Subsite of the Cherokee County, Kansas Superfund Site and the Waco Designated Area of the Jasper County, Missouri Superfund Site.

FOR THE UNITED STATES OF AMERICA

9/25/07
Date

Bruce S. Gelber
Section Chief
Environment and Natural Resources Division
U.S. Department of Justice
Washington, D.C. 20530

9/19/2007
Date

Paul Gormley
Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. E.I. du Pont de Nemours and Company; NL Industries, Inc.; and Sunoco, Inc., relating to the Waco Subsite of the Cherokee County, Kansas Superfund Site and the Waco Designated Area of the Jasper County, Missouri Superfund Site.

FOR THE UNITED STATES OF AMERICA

ENVIRONMENTAL PROTECTION AGENCY

11/17/06
Date

Cecilia Tapia
Superfund Division Director, Region VII
U.S. Environmental Protection Agency
901 N. 5th Street
Kansas City, KS 66101

11/9/06
Date

Robert W. Richards
Assistant Regional Counsel, Region VII
U.S. Environmental Protection Agency
901 N. 5th Street
Kansas City, KS 66101

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. E.I. du Pont de Nemours and Company; NL Industries, Inc.; and Sunoco, Inc., relating to the Waco Subsite of the Cherokee County, Kansas Superfund Site and the Waco Designated Area of the Jasper County, Missouri Superfund Site.

For E.I. du Pont de Nemours and Company:

10/24/06
Date

Signature: [signature]
Name (print): GUY V. JOHNSON
Title: CORPORATE COUNSEL
Address: LEGAL D-7090-2
1007 MARKET STREET
WILMINGTON,
DE 19898

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name (print): [illegible]
Title: CORPORATE COUNSEL
Address: E.I. du PONT de NEMOURS AND COMPANY
LEGAL D-7090-2, 1007 MARKET ST.
WILMINGTON DE 19898
Ph. Number: (302) 774-1189

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. E.I. du Pont de Nemours and Company; NL Industries, Inc.; and Sunoco, Inc., relating to the Waco Subsite of the Cherokee County, Kansas Superfund Site and the Waco Designated Area of the Jasper County, Missouri Superfund Site.

For NL Industries, Inc:

10/12/2006
Date

Signature: _____
Name (print): Robert Graham
Title: VP and General Counsel
Address: Three Lincoln Centre, Suite 1700
5430 LBJ Freeway
Dallas, TX 75240

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name (print): _____
Title: General Counsel
Address: Three Lincoln Centre, Suite 1700
5430 LBJ Freeway
Dallas, TX 75240
Ph. Number: 972-233-1700

THE UNDERSIGNED PARTY enters into this Consent Decree in the matter of United States v. E.I. du Pont de Nemours and Company; NL Industries, Inc.; and Sunoco, Inc., relating to the Waco Subsite of the Cherokee County, Kansas Superfund Site and the Waco Designated Area of the Jasper County, Missouri Superfund Site.

For Sunoco, Inc.:

10/18/06
Date

Signature: _____
Name (print): Thomas W Hofmann
Title: Senior Vice President
Address: Sunoco, Inc
1735 Market Street
Philadelphia, PA 19103

Agent Authorized to Accept Service on Behalf of Above-signed Party:

Name (print): Thomas J. Haines
Title: Senior Counsel
Address: Sunoco, Inc Law Dept.
1735 Market Street
Philadelphia, PA 19103
Ph. Number: 215 977-6273

APPENDIX A1

RECORD OF DECISION

CHEROKEE COUNTY SUPERFUND SITE
BADGER, LAWTON, WACO, AND CRESTLINE SUBSITES
OPERABLE UNIT #06

CHEROKEE COUNTY, KANSAS

Prepared by:

U. S. Environmental Protection Agency, Region 7
901 North 5th Street
Kansas City, Kansas 66101

September 2004

TABLE OF CONTENTS

RECORD OF DECISION

DECLARATION

SITE NAME AND LOCATION

Badger, Lawton, Waco, and Crestline Subsites, Operable Unit #06 (OU-6)
Cherokee County Superfund Site
Cherokee County, Kansas

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for mining wastes at OU-6 of the Cherokee County Superfund site. This decision was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the site. The Administrative Record file is located at the following information repositories:

Columbus Public Library	U.S. Environmental Protection Agency
205 North Kansas Avenue	901 North 5th Street
Columbus, Kansas	Kansas City, Kansas

The state of Kansas concurs with this selected remedy. Additionally, the U.S. Fish and Wildlife Service concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response actions selected in this Record of Decision (ROD), present a current threat to public health, welfare, or the environment. The site contains heavy metals in various environmental media resulting from historic lead-zinc mining and processing.

DESCRIPTION OF THE SELECTED REMEDY

The U.S. Environmental Protection Agency (EPA) believes the selected remedy (Alternative 4A with an estimated cost of 7 million dollars) appropriately addresses the principal current and potential risks to human health and the environment. The remedy addresses ecological and human health risks by the remediation of surficial mining wastes and sediments impacted by heavy metals. The major components of the selected remedy for the four subsites (Badger, Lawton, Waco, and Crestline) include the following actions.

- Excavate, consolidate, and/or cap all surficial mining wastes and excavate metals-impacted sediments from subsite streams followed by disposal and capping.

- Utilize subaqueous mine waste disposal to the maximum extent practicable, with the exception of remedial actions at the Badger subsite. For the Badger subsite, excavate mining wastes and dispose of materials in conventional repositories located beyond the limits of the 100-year flood plain of the Spring River.

- Abandon deep wells to prevent cross-contamination between the shallow and deep aquifers.

- Characterize and monitor the groundwater flow system for assessment of the subaqueous mine waste disposal components of the remedy.

- Adopt institutional controls for future development as specified in an earlier ROD.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state laws that are legally applicable or relevant and appropriate requirements (ARARs) for the remedial action, and is cost effective. The remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, but may not satisfy the statutory preference for treatment as a principal element because of the large volume and potentially expensive methods to stabilize or treat the mining wastes and the effectiveness of non-treatment alternatives. Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

Cecilia Tapia, Director
Superfund Division

Date 9/30/04

RECORD OF DECISION

DECISION SUMMARY

SITE NAME, LOCATION, AND DESCRIPTION

The Cherokee County Superfund site (CERCLIS I.D. # KSD980741862) spans 115 square miles and represents the Kansas portion of the former Tri-State mining district. The Cherokee County Superfund site is arranged into seven operable units (OUs) for administrative efficiency in conducting environmental cleanups: OU-1, Galena Alternate Water Supply; OU-2, Spring River Basin; OU-3, Baxter Springs subsite; OU-4, Treece subsite; OU-5, Galena Groundwater/Surface Water; OU-6, Badger, Lawton, Waco, and Crestline subsites; and OU-7, Galena Residential Soils. The Cherokee County site is depicted on Figure 1.

This ROD is concerned solely with OU-6, consisting of the Badger, Lawton, Waco, and Crestline subsites that are located in the northern portion of the site and are shown on Figures 2 and 3. Contaminated media at the OU-6 subsites include mining wastes, sediments, soils, groundwater, and surface water. The contaminants of concern are zinc, lead, and cadmium. The contamination was caused by lead and zinc ore mining and processing that began in Kansas in the 1870s and continued until 1970. The mining and processing generated chat piles and tailings, collectively known as milling wastes, that are the sources of the contaminants of concern.

The EPA is the lead agency and the state of Kansas, the Kansas Department of Health and Environment (KDHE), is the support agency for this remedy selection. The sources of cleanup monies will likely include the Superfund Trust Fund, state of Kansas cost share, and enforcement/ responsible party funding and/or work.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

The EPA placed the Cherokee County Superfund site on the National Priorities List (NPL), set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on September 8, 1983, 48 Fed. Reg. 40658. Subsequent to the NPL listing, investigation of the subsites has consisted of a remedial investigation and feasibility study (RI/FS), a subaqueous mine waste disposal pilot study, site inspections, and sample collection/analysis by the EPA and the KDHE. Currently, no remedial actions have taken place at the subsites. However, the subject of this ROD is the selection of the appropriate remedial action to be taken at the subsites.

The EPA, through its enforcement authorities, negotiated an Administrative Order on Consent (AOC) with certain potentially responsible parties (PRPs) to conduct the RI/FS for the subsites. The PRPs performing the RI/FS under the AOC were Cyprus Amax Minerals

Corporation (corporate successor is currently Phelps Dodge Corporation), E.I. du Pont de Nemours and Company (Dupont), NL Industries, Inc., and Sun Company, Inc. In performance of the RI/FS under that AOC, the PRPs were partially compensated from certain proceeds from the EPA's settlements in connection with the bankruptcy of Eagle Picher Industries, Inc., which was another PRP for the subsites.

During the course of the RI/FS for the subsites, as well as for work at other subsites within the greater Cherokee County Superfund site, the EPA and the KDHE have conducted numerous public meetings and availability sessions, distributed and mailed factsheets, and have been interviewed by local print and broadcast media outlets. Additionally, several site tours have been conducted for many diverse groups inclusive of federal and state agencies, universities, professional organizations, and political entities. Efforts were made to solicit views on reasonably anticipated future land use and potential beneficial uses of groundwater during the RI/FS phase and at the public meeting for the Proposed Plan on June 22, 2004.

COMMUNITY PARTICIPATION

The public was encouraged to participate in the Proposed Plan and ROD process at OU-6 and has historically been made aware of the environmental issues in the county through the many public meetings, public availability sessions, newspaper articles, television coverage, radio broadcasts, and press releases that have occurred at the site for the many environmental cleanups conducted to date. In order to provide the community with an opportunity to submit written or oral comments on the OU-6 Proposed Plan, the EPA established an initial 30-day public comment period from June 7 to July 6, 2004. This comment period was expanded an additional 30 days to August 6, 2004 pursuant to a PRP request for an extension. A public meeting was held on June 22, 2004, at 7:00 p.m. at the Cherokee County Health Department, 110 East Walnut Street, Columbus, Kansas, to present the Proposed Plan, accept written and oral comments, and to answer any questions concerning the proposed cleanup remedy. Nearly 40 people attended the public meeting and the event was covered by local newspaper and television affiliates. A summary of the verbal questions received at the public meeting, inclusive of responses, is provided in the attached Responsiveness Summary. The Responsiveness Summary also contains a summary of written correspondence received during the public comment period as well as written responses to that input.

The Proposed Plan and supporting Administrative Record file were made available for public review during normal business hours at the Columbus Public Library in Columbus, Kansas, and at the EPA's office in Kansas City, Kansas. Additional administrative record files supporting the EPA's historic cleanups at the Baxter Springs/Treece subsites and Galena subsite are also available at the EPA's office and at the Johnston Public Library in Baxter Springs, Kansas, and the Galena Public Library in Galena, Kansas, respectively. These additional administrative records are incorporated into the OU-6 Administrative Record by reference. Moreover, the OU-6 Administrative Record has been updated with additional information (September 2004 addendum) to support this ROD.

SCOPE AND ROLE OF OPERABLE UNITS

The Cherokee County site is arranged into the following seven OUs for administrative efficiency in conducting environmental cleanups: OU-1, Galena Alternate Water Supply; OU-2, Spring River Basin; OU-3, Baxter Springs subsite; OU-4, Treece subsite; OU-5, Galena Groundwater/Surface Water; OU-6, Badger, Lawton, Waco, and Crestline subsites; and OU-7, Galena Residential Soils. A brief overview of the status of each Cherokee County operable unit is provided below:

OU-1: Galena Alternate Water Supply - This OU is in the long-term operation and maintenance (O&M) phase. The completed EPA funded cleanup consisted of providing a permanent water supply to over 400 residences by the installation of deep aquifer drinking water supply wells and the formation of a rural water district. The district has expanded by over 100 new hook ups (> 500 total) since the cleanup was completed in 1994 and serves the rural areas of Galena, Kansas.

OU-2: Spring River Basin - This OU consists of the Spring River in Kansas, and as such, it is directly influenced by the other subsite cleanups at the Cherokee County site as well as upstream cleanups planned for the Jasper County, Missouri, Superfund site. The work is in the characterization phase and will likely represent the final area to be addressed at the Cherokee County site.

OU-3: Baxter Springs Subsite - This cleanup was completed and transitioned to the O&M phase in 2004. The work included the remediation of over 160 acres of mining wastes inclusive of the removal of impacted stream sediments from Spring Branch and a tributary to Willow Creek. Spring Branch and Willow Creek are tributaries of the Spring River. The cleanup also included the abandonment of deep aquifer wells, the remediation of over 40 residential properties, and the characterization of over 300 properties. This cleanup was fully funded and performed by PRPs.

OU-4: Treece Subsite - A residential cleanup was completed by PRPs at this subsite in 2000. Over 40 properties were remediated and approximately 150 properties were characterized. The mining waste cleanup aspect of this subsite was held in abeyance and is subject to re-opening in the future.

OU-5: Galena Groundwater/Surface Water - The EPA funded cleanup was completed in 1995 and the OU is in the long-term O&M phase. The work included the remediation of 900 acres of mining wastes and the abandonment of deep wells acting as a potential conduit for contaminants to migrate from the upper impacted aquifer to the lower pristine aquifer. A subsequent multi-year ecological study conducted by the University of Kansas Biological Survey indicated some improvement to Short Creek following the cleanup. The KDHE is currently evaluating ongoing O&M costs at this OU.

OU-6: Badger, Lawton, Waco, and Crestline Subsites - This ROD focuses on the Badger, Lawton, Waco, and Crestline subsites that are located in the northern portion of the site and are shown on Figures 2 and 3. These subsites represent locations of historic lead and zinc mining in the Tri-State mining district and are similar to the mine waste areas addressed at OU-3 and OU-5 of the Cherokee County site, except for OU-6 the Spring River tributaries are Cow Creek and Shawnee Creek. The RI/FS process has been completed, and OU-6 is at the decision document phase, currently the subject of this ROD.

OU-7: Galena Residential Soils - The EPA funded cleanup was completed in 2001 and is now in the long-term O&M phase. The work included the characterization of nearly 1,500 residential properties and the remediation of over 700 properties.

SITE CHARACTERISTICS

The physical characteristics of the subsites include the presence of mine shafts, mine subsidence pits, impoundment tailings, chat piles, overburden piles, collapse features, mine ponds, and bull rock piles. Milling wastes are grouped into two broad categories, chat and tailings, while non-milling wastes are also grouped into the two categories of overburden and bull rock. Chat is composed of gravel- and sand-sized materials that are typically found in large piles while tailings are fine-, silt- to clay-sized, wastes that are typically found in areas impounded by berms or dikes. Chat and tailings are the hazardous source materials of concern due to elevated levels of heavy metals, especially zinc, lead, and cadmium. They are the residual bedrock, or host ore body, materials remaining from the milling process.

Overburden is typically found in piles composed of large boulder-sized material predominantly comprised of shale and limestone. This non-hazardous material was removed or excavated in order to reach the deeper ore bearing zones. Bull rock is a local term for the cobble to boulder sized material typically found in cone-shaped piles and comprised of cherty limestone and breccia. Bull rock is material that did not meet milling requirements and may also consist of overburden materials removed prior to reaching the prime ore bearing zones. Bull rock may exhibit low-grade mineralization but is generally considered non-hazardous.

The mining areas also contain many ponds, pits, collapses, and shafts that are water-filled and contain surface water and/or groundwater depending upon the characteristics of the individual features. The pits and collapse features develop due to the extensive amount of undermined areas within the subsites. These features are a result of ground collapse in an area underlain by subsurface room and pillar mining. The mine shafts were used for access and ore extraction and there are also many exploration drill holes and air shafts within the subsites. Open shafts, pits, collapses, and ponds receive heavy metals laden runoff from mine tailings and chat piles in many instances.

The major geographic features impacting remedy selection are the Spring River, its tributaries, and certain ponds. These surface water bodies are influenced by subsite waste and adversely affect aquatic life, and possibly waterfowl. The Spring River is a major interstate stream and is located approximately one mile to the east of the site. All of the subsites are within the Spring River drainage basin and all surface flows are to the Spring River or its tributaries. Cow Creek and Shawnee Creek are the two primary tributaries of the Spring River in Kansas and they flow to the south prior to entering the Spring River. Cow Creek enters the Spring River about one to two miles south of Lawton, Kansas, and Shawnee Creek enters the Spring River near Riverton, Kansas. These tributaries are plains-type streams underlain by Pennsylvanian age shale, and as such, base flows are poorly sustained by groundwater recharge during dry seasons. The KDHE chronic aquatic life criteria have been exceeded in Cow Creek and Shawnee Creek. Additionally, mining related zinc load contributions to the Spring River are provided by Turkey Creek and Center Creek, predominantly from mining-impacted areas in Missouri.

The subsites are underlain by two aquifers that are separated by a confining unit. The upper aquifer is locally called the Boone Aquifer and is a Mississippian age limestone unit that exhibits water table conditions, except for areas overlain by Pennsylvanian age shale deposits where semi-confined to confined aquifer conditions exist. The lower carbonate aquifer, known as the Roubidoux, is confined, and the regional groundwater flow direction is west to northwest. Public water supply districts provide water from the deep aquifer to most residents of the subsites. A small number of households have shallow private wells in the Boone Aquifer and the water quality of these sources was tested and found to be acceptable during earlier phases of the work conducted at the subsites. Shallow groundwater in the mine workings typically exceeds water quality standards but the extent of the impacted groundwater has not been characterized to date.

Past practices in the greater Cherokee County Superfund site have resulted in chat being distributed to residential yards as fill or driveway material. However, sampling of residential yards in proximity to the mining wastes in the subsites did not identify any residential properties that required remediation, as has occurred at other subsites in Cherokee County.

The extent of the chat piles, tailings impoundments, and sediments impacted by the mining wastes, is depicted on the attached maps of the area (Figures 2 through 7). Streams and ponds are depicted as well. All surface water flows in the area of the subsites are to the Spring River or its two primary tributaries, Cow Creek and Shawnee Creek.

The primary source material for principal threats to the subsites are the chat piles and tailings, as well as some stream sediment areas where the mine waste materials have washed into the streams. The volume of the chat and tailings is estimated in the range of 1.8 to 2.3 million cubic yards.

CURRENT AND POTENTIAL FUTURE LAND USE AND RESOURCE USES

Currently the subsites are accessible by gravel roads, or by foot. An unused rail line traverses the general area, as does the Spring River and its tributaries. The current and expected future use of the area is agricultural, primarily farming and grazing, but the areas of chat piles, tailings, ponds, pits, and subsidence areas are not vegetated and are essentially unused by humans. While some chat piles in the greater Cherokee County Superfund site have been exploited commercially to supply aggregate for roadway construction, no chat piles in the subsites are currently used to supply aggregate. Some residences are near the subsites. Maps of the subsites (Figures 2 and 3) depict the major features of the area.

SUMMARY OF SITE RISKS

Ecological Risks

Ecological risks constitute the primary site risks and are present due to elevated levels of heavy metals in mining wastes, soils, sediments, groundwater, and surface water within the subsites. The primary exposure route consists of the uptake of heavy metals by ecological receptors such as fish, macro-invertebrates, birds, and other terrestrial species. Zinc, lead, and cadmium are the major contaminants of concern for ecological receptors and also represent the principal threats. Ecological receptors are exposed to heavy metals primarily by ingestion of impacted mine wastes, soils, surface water, vegetation, and prey as well as inhalation of toxic dusts. Toxicity quotients, a measure of ecological risk, have been calculated in many former mined areas of the Tri-State mining district and they indicate the presence of ecological risks (toxicity quotient values > 1). Additionally, recent studies by the U.S. Fish and Wildlife Service indicate mining impacts to migratory waterfowl and wild birds.

The average concentrations of heavy metals in Cherokee County, Kansas, chat mining wastes are 8,300 parts per million (ppm) zinc, 750 ppm lead, and 46 ppm cadmium, and the average concentrations in tailings are 21,600 ppm zinc, 3,800 ppm lead, and 124 ppm cadmium, as based on the RI at OU-3/4. Maximum values of heavy metals in chat mining wastes are 13,000 ppm zinc, 1,660 ppm lead, and 89 ppm cadmium, while the maximum values for tailings are 52,000 ppm zinc, 13,000 ppm lead, and 540 ppm cadmium, as based on the OU-3/4 RI report.

Sediment data from OU-6 have shown maximum values of 29,500 ppm zinc (Waco subsite), 675 ppm lead (Crestline subsite), and 182 ppm cadmium (Waco subsite), as based on the OU-6 RI report, while mine waste data from the Waco, Missouri, area adjacent to OU-6 yield maximum values of 13,300 ppm zinc, and 1,500 ppm lead based on field data from the Crestline subsite. Average chat mine waste values of 12,675 ppm zinc, 159 ppm lead, and 89 ppm cadmium have been reported in the OU-6 FS report for the Waco, Missouri, area adjacent to a portion of OU-6.

Whole body fish tissue samples were analyzed at OU-6 during the RI and yielded the following maximum wet-weight values: 167 ppm zinc at the Crestline subsite; 1.81 ppm lead at the Waco subsite; and 0.371 ppm cadmium at the Lawton subsite. Reference values for locations in the Spring River upstream of Waco, Missouri, as reported in the OU-6 RI, consist of the following for non-bottom feeding and bottom-feeding species, respectively: 45.83 to 57.43 ppm zinc; 0.759 to 1.421 ppm lead; and 0.184 to 0.224 cadmium.

Human Health Risks

Human health risks are present due to elevated levels of heavy metals in the same media described above. The contaminants of concern are the same (zinc, lead, and cadmium); however, the principal threats for human health risks are lead and, to a lesser degree, cadmium. The wastes are located in rural areas and all nearby homes have been sampled for heavy metals in residential yard soils and all known households with private water wells have been tested; all of the residential yard soil and groundwater results have been below levels of concern. Thus, primary human health risks include the use of mining wastes for residential applications, future residential development, and trespassing. These risks are less of a concern as contrasted to ecological risks due to the remote nature of the subsites and the lack of new or proposed residential construction in the area. Trespassing would likely consist of hunting, fishing, and the illegal disposal of refuse, and as such, would not likely constitute a significant human health risk.

It is the EPA's current judgement as lead agency that the selected alternative identified in this ROD is necessary to protect public health or welfare of the environment from actual or threatened releases of hazardous substances into the environment. This view is also held by the KDHE, the support agency representing the state of Kansas, as well as the U.S. Fish and Wildlife Service.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are cleanup goals that are addressed by reducing or eliminating contaminants or exposure routes. RAOs are media-specific and are provided in Table 1. There are seven total RAOs; two for soils and source materials, two for surface water and sediments, and three for groundwater.

The soils and source materials RAOs specify the prevention of ecological and human health risks associated with the exposure to soils and mining waste source materials containing heavy metals. These RAOs are met by relocating, consolidating, disposing, and capping all surface accumulations of soils and mining waste source materials. The contaminated media will be rendered unaccessible by human or ecological receptors and thus the RAOs will be satisfied.

The surface water and sediment RAOs specify the prevention of ecological risks by reducing the exposures related to metals-impacted surface water and sediment. The excavation, disposal, and capping of sediments exceeding risk- or background-based levels will remove the

threat to ecological receptors. Implementing these RAOs, in combination with the soil and source materials actions, will reduce or eliminate the sources and levels of heavy metals in surface water.

The groundwater RAOs specify the prevention of human health and ecological risks resulting from metals-impacted groundwater. Preventing the downward migration of contaminants to the lower aquifer by sealing deep wells or boreholes that act as conduits, in combination with the reduction or elimination of groundwater impacts via the soils and source materials RAOs, will result in improvements to the groundwater system.

For OU-6, the proposed remedial action is primarily expected to accomplish a reduction of lead, cadmium, and zinc loading on the Spring River and its tributaries, in both the surface waters and in the sediments. Moreover, the complete removal of impacted sources eliminates ecological and human health risk pathways and reduces or eliminates the degradation of groundwater via source removal. Currently, human exposure via residential soils and groundwater in the proximity of the subsites does not exceed action levels. The human health and ecological risks are associated with non-residential mining wastes. The proposed remedial action does not include new or additional institutional controls because they are specified on a county wide basis in a prior ROD. Adoption of these existing controls is a component of this ROD where deemed necessary.

DESCRIPTION OF ALTERNATIVES

Various cleanup alternatives were evaluated in order to select the optimum approach to address site risks. A total of six candidate alternatives were initially screened during the FS process and five of these approaches were carried forward for a more detailed assessment of their viability. The five cleanup alternatives subjected to a detailed analysis are described on Table 2 and were developed in order to address the site-specific RAOs. Each of the five potential alternatives, in addition to an alternative developed by the EPA as a modification of Alternative 4, designated as Alternative 4A, are briefly summarized in the following paragraphs. Alternative 3 is not included since it was not carried forward for a detailed assessment in the FS report. More detailed information regarding the various alternatives is available in the FS and Administrative Record file.

Alternative 1: No Further Action - This remedy is required for evaluation as a baseline approach in order to fully assess and compare the other more protective remedies. This approach does not include any active engineering or remedial activities to address the RAOs and site risks. The remedy includes some amount of basic water quality monitoring on Spring River, Cow Creek, and Shawnee Creek in addition to the implementation of an institutional controls program addressing the following elements: restrictions on new residential development in mine waste areas; restrictions on the drilling and installation of new domestic water supply wells; encouragement of local citizens to utilize existing rural water districts for domestic needs; and the implementation of casing integrity standards and oversight for the design and construction of

new deep aquifer supply wells. These institutional controls are adopted from the ROD for OU-3/4, the Baxter Springs and Treece subsites, dated August 1997. The estimated capital and O&M costs for this remedy are less than $500,000.

Alternative 2: Water Management and Erosion Controls - This alternative includes the actions described in Alternative 1 and also addresses surface water and sediment RAOs by implementing engineering drainage, water management, and erosion controls in addition to excavation and on-site containment (consolidation and capping) of selected source materials (mill wastes and sediments) in order to reduce metal and sediment loads to classified perennial streams and rivers with a secondary goal being the reduction of loads to ephemeral tributaries. This approach includes limited sediment removal from ephemeral stream channels that contribute significant metal and sediment loads to state-listed streams and also includes the abandonment of deep aquifer wells to prevent cross-contamination between the impacted shallow and pristine deep aquifers. The water management aspects involve diversion of clean runoff around mined areas and detaining on-site runoff utilizing berms, dikes, swales, and detention ponds. This alternative reduces metal and sediment loadings but is not intended to meet Kansas surface water aquatic life criteria and does not address all accumulations of surficial wastes. This approach is similar to the cleanup approach conducted at the Baxter Springs subsite (OU-3) of the Cherokee County site and is thus not expected to meet all ARARs, particularly chemical-specific ARARs (Kansas surface water aquatic life criteria). The estimated capital and O&M costs are less than $3,000,000.

Alternative 4: Source Removal and Subsidence Pit Disposal - This alternative includes the actions prescribed by Alternatives 1 and 2 and expands the cleanup to include all mill wastes and channel sediments that are actively contributing metals or sediment loads to surface waters. This alternative utilizes mine subsidence features to the maximum extent practicable as permanent repositories for excavated mill and sediment mining wastes, in addition to conventional consolidation and capping methods. However, subsidence pit disposal is not employed as an approach near streams or flood plains and is thus not included in the actions for the Badger subsite due to the possible impacts to the Spring River as a result of subaqueous mine waste disposal. Mine wastes at the Badger subsite will be excavated and relocated to repositories above the 100-year flood plain of the Spring River. All wastes contributing to Kansas aquatic life criteria exceedances would be addressed by this approach. This alternative addresses a greater amount of surficial wastes as contrasted to Alternative 2 but does not address all surficial accumulations. Ecological risks posed by existing non-remediated areas of mining wastes would not be addressed by this remedy and human health risks related to these remaining accumulations would be reliant upon institutional controls that are not currently enacted. The estimated capital and O&M costs are $5,000,000.

Alternative 4A: Complete Source Removal, Capping, and Subsidence Pit Disposal - This alternative includes identical actions specified in Alternative 4 at the Badger, Lawton, and Crestline subsites. Alternative 4A modifies the Alternative 4 approach at the Waco subsite to include all surficial mining wastes (approximately 100 additional acres). Alternative 4 addresses

all surficial wastes at the Badger, Lawton, and Crestline subsites, but specifies a lesser remediation of mining wastes at the Waco subsite. Alternative 4A expands Alternative 4 by addressing all surficial mining wastes at the Waco subsite and is thus consistent with the actions conducted at the remaining subsites. Additionally, Alternative 4A includes the use of numeric standards for sediment remediation and the assessment and potential mitigation of sediment impacts associated with water-filled features (ponds, collapses, pits, etc.) remaining on-site following the cleanup. The capital and O&M costs for Alternative 4A are estimated at $7,000,000.

Alternative 5: On-site Containment and Erosion Control - This alternative includes the actions described in Alternatives 1 and 2 in addition to conventional excavation, consolidation, and capping of excavated mill wastes and sediments contributing to aquatic life criteria exceedances. This alternative is identical to Alternative 4 in that it addresses wastes contributing to Kansas surface water aquatic life criteria exceedances, but it does not employ subaqueous mine waste disposal. All wastes are consolidated and capped above the ground surface and some wastes may be capped in-place. This alternative addresses a greater amount of surficial wastes as contrasted to Alternative 2, an identical amount as Alternative 4, but does not address all surficial accumulations. Ecological and human health risks remain as discussed for Alternative 4. The estimated capital and O&M costs for Alternative 5 are $5,000,000.

Alternative 6: Source Removal and On-site Disposal - This alternative includes the actions described in Alternatives 1, 2, and 5 in addition to addressing all surficial wastes by placement of excavated wastes into engineered repositories and employing various multi-layered capping designs for repositories and capped subsidence pits in order to completely reduce infiltration. This remedy is the most comprehensive as it addresses all surficial wastes, requires excavation of all wastes, and specifies the construction of engineered repositories with sophisticated cap designs for all excavated materials. Alternative 6 prohibits subaqueous mine waste disposal at all subsites except the Waco subsite, and the technology is minimized to the extent practicable at this subsite. This alternative would meet all ARARs and be protective of all human and ecological receptors. The estimated capital and O&M costs are greater than $10,000,000.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The NCP requires the EPA to evaluate selected remedial alternatives considering nine criteria. Any selected or preferred remedy must satisfy all nine criteria before it can be implemented. The nine criteria are divided into the following groupings: two threshold criteria; five balancing criteria; and two modifying criteria. The two threshold criteria are overall protection of human health and the environment and compliance with ARARs. Generally, alternatives must satisfy the two threshold criteria or they are rejected without further considering the remaining criteria. The five balancing criteria consist of the following: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume achieved through treatment; implementability; short-term effectiveness; and cost. Lastly, the two modifying

criteria consist of state and community acceptance. The modifying criteria were fully evaluated following state and public input as discussed in this document and the Responsiveness Summary (Attachment 1).

Threshold Criteria Evaluation

The threshold criteria of overall protection of human health and the environment and ARARs compliance addresses whether a remedy provides adequate protection by reducing, eliminating, or controlling pathway risks through treatment, engineering, and institutional controls in addition to meeting the ARARs of federal and state laws. Compliance with chemical-specific, location-specific, and action-specific ARARs is required unless a site-specific waiver is justified. This site does not justify the waiver of any ARARs.

The selected remedy is a modified version of Alternative 4, with costs estimated at 7 million dollars, and is designated as Alternative 4A (Complete Source Removal, Capping, and Subsidence Pit Disposal). This alternative will meet the threshold criteria of protecting human health and the environment and complying with ARARs through the implementation of engineering controls. Excavation, consolidation, subaqueous disposal, capping, capping in place, and re-vegetation of all surficial mine waste accumulations, in conjunction with the excavation of impacted sediments, will eliminate human and ecological (terrestrial/aquatic organisms and birds) risks by engineering methods. Additional remedy components include the characterization of groundwater conditions, plugging of deep wells, and assessment of non-stream (ponds, pits, collapses) sediments followed by potential capping. All chemical-, location-, and action-specific ARARs will be met by the preferred alternative.

Potential Alternatives 1 (No Action) and 2 (Water Management and Erosion Controls) do not meet the threshold criteria of protecting human health and the environment and complying with ARARs. Alternative 1 does not include any engineering actions and basically relies upon monitoring to continue to evaluate site conditions in addition to institutional controls. These actions would not be protective of human health and the environment and would not comply with ARARs. Alternative 2 specifies limited engineering actions and is not designed to meet ARARs nor would it provide optimum protection of human health and the environment. An ARARs waiver is not contemplated for this cleanup. Alternatives 1 and 2 do not satisfy the threshold criteria.

Potential Alternatives 4 (Source Removal and Subsidence Pit Disposal) and 5 (On-site Containment and Erosion Control) do not satisfy the threshold criteria as Alternatives 4A and 6 because they do not address all surficial wastes in all subsites and thus would not be fully protective of ecological and human receptors. Alternatives 4 and 5 meet the threshold criteria in the Badger, Lawton, and Crestline subsites, but do not meet the criteria in the Waco subsite. All surficial mine waste accumulations were not addressed by this alternative at the Waco subsite in contrast to the other three subsites. Additionally, human health risks in areas of existing mine wastes would be subject to reliance on institutional controls that have not been enacted, as opposed to engineering controls, and are thus considered less protective.

Potential Alternative 6 (Source Removal and On-site Disposal) meets the threshold criteria by addressing all surficial mining wastes, maximizing the degree of mine waste excavation and consolidation, and employing the use of sophisticated engineered cap and cover designs for maximum infiltration reduction. The remaining assessment of balancing and modifying criteria will focus on alternatives that optimally satisfy the threshold criteria: Alternatives 4A and 6.

Balancing Criteria Evaluation

Descriptions of the five balancing criteria include the following: long-term effectiveness and permanence addresses the ability of a remedy to maintain protection of human health and the environment over time, inclusive of residual risks following implementation; reduction in toxicity, mobility, or volume through treatment addresses the degree to which a remedy employs recycling or treatment methodologies to control principal threats; implementability describes the technical and administrative feasibility of implementing a cleanup approach including the difficulty of undertaking additional follow-on actions; short-term effectiveness addresses the time required for implementation and any adverse impacts during implementation; and cost describes the direct and indirect capital costs of the alternative. The balancing criteria are applied to potential remedies that satisfy the earlier threshold criteria and are thus moved forward for additional evaluation. Therefore, Alternatives 4A and 6 will be exclusively discussed in the balancing criteria evaluation.

Alternatives 4A and 6 meet all five of the balancing criteria although distinctions exist. Alternative 4A may potentially have a lesser degree of long-term effectiveness and permanence as contrasted to Alternative 6 due to the relatively novel approach of subaqueous mine waste disposal. A recent pilot study did not conclusively illustrate the long-term effectiveness and permanence of subaqueous mine waste disposal due to ongoing potential concerns related to groundwater impacts. This approach is not suitable in areas adjacent to streams or in highly transmissive aquifer materials. However, the pilot study results appear sufficient to employ this remedy in a larger scale remedial application as a technology demonstration or validation approach. Alternative 6 would have a greater surficial area to maintain, and thus may also have issues with the long-term maintenance aspects of the engineered caps. Alternative 4A has an advantage of a lesser area subject to long-term maintenance, providing the underlying groundwater does not become an issue.

Alternative 4A may potentially not have the degree of reduction of toxicity or mobility of contaminants as contrasted to Alternative 6 based on the earlier discussion of potential groundwater impacts over time. Both remedies do not employ treatment; however, Alternative 4A may prove to constitute treatment pending additional evaluations of geochemical conditions over time. Many large area lead site remedial actions do not satisfy the treatment preference due to the presence of large volume of wastes dispersed over great areas. Alternative 4A has an advantage of possibly demonstrating the technical effectiveness of a new technology, subaqueous mine waste disposal, that may have great utility at future sites. Alternative 6 provides the greatest reduction of toxicity and mobility by employing sophisticated caps that essentially alleviate infiltration.

Both remedies are easily implemented but Alternative 4A has advantages over Alternative 6 in this regard. Each remedy utilizes standard construction equipment; however, Alternative 6 will take longer than Alternative 4A to construct; thus, Alternative 4A is favored with regard to time for implementation. Additionally, Alternative 4A utilizes a smaller area for remediation as contrasted to Alternative 6, and thus may be more amenable to affected landowners.

Alternative 4A has short-term impacts due to the potential increase in groundwater concentrations of heavy metals following subaqueous disposal. However, Alternative 6 may also have equal or greater short-term impacts as it requires a longer implementation time frame and involves the excavation and transportation of large volumes of materials.

Alternative 4A is more favorable than Alternative 6 with regard to cost. Alternative 4A, with estimated capital and operation and maintenance costs of 7 million dollars, is less costly than Alternative 6 which has an estimated cost greater than 10 million dollars.

In summary, Alternative 4A is favored in regard to cost and implementability while Alternative 6 is favored in regard to long-term effectiveness and permanence and reduction in toxicity and mobility through treatment. However, Alternative 4A may prove to be as successful in long-term effectiveness and reliability, may satisfy the treatment preference, and the implementation would serve as a valuable remedial-scale test of a promising new technology. Both remedies appear essentially equal in regard to short-term effectiveness.

Modifying Criteria Evaluation

The two modifying criteria of community and state acceptance are intended to assess the views of both groups regarding various cleanup approaches. The state of Kansas is represented by the KDHE and the public is represented by the local affected community. Views of the state are well known since the KDHE has been involved in many aspects of the project to date. Community views are fairly well known based on interactions with local land owners, local government officials, and similar situations at nearby subsites of the Cherokee County Superfund site that have historically been through this similar process.

Alternatives 4A and 6 are expected to be acceptable to the public and are known to be acceptable to the state of Kansas. The public has historically expressed a desire for environmental remedies that address all surficial accumulations of mining wastes and both of these alternatives meet these desires. The state of Kansas has recently expressed a similar desire that all surficial mining wastes be addressed and this preference is also met by both of these remedies. Alternative 4A may potentially have greater public acceptance since it involves filling many open mine collapse features which are typically sites for the dumping of refuse by unauthorized trespassers and also present physical hazards. Additionally, Alternative 4A will have a smaller area of remediated land requiring long-term O&M and thus may be more desirable to the KDHE and the public as compared to Alternative 6. Alternative 4A would return a greater

acreage of land back to productive agricultural use since the remedy involves greater consolidation and the use of subaqueous disposal as contrasted to above ground disposal methods specified by Alternative 6. The KDHE has expressed support for Alternative 4A and the U.S. Fish and Wildlife Service has also expressed a similar view.

PRINCIPAL THREAT WASTES

Principal threat wastes are source materials that require remediation based on toxicity, mobility, and the potential to create unacceptable human health or ecological risks. The NCP establishes a preference that treatment will be used to address principal threat wastes when practical. Treatment will not be employed at this site due to the widespread nature of the contaminants, large volumes of materials, and the effectiveness of non-treatment technologies (excavation, consolidation, capping, re-vegetating, subaqueous disposal) for the remediation of mining wastes. It should be noted that subaqueous mine waste disposal may constitute treatment if altered geochemical conditions are established. This aspect of the remedy will be assessed over time.

The principal threat wastes at the subsites consist of mining wastes and mining impacted sediments. The total volume of principal threat wastes at all four subsites is estimated at approximately two million cubic yards. Mining wastes may be segregated into two distinct types of materials, chat and tailings, and these materials ultimately impact surface water, groundwater, sediments, and soils. The chat and tailings are milling wastes and their characteristics are discussed in the earlier site characteristics portion of this document. The contaminants of concern are zinc, lead, and cadmium.

SELECTED REMEDY

The selected cleanup approach for addressing the mining waste impacting OU-6 subsites is a modified verison of Alternative 4 (Source Removal and Subsidence Pit Disposal), which is designated as Alternative 4A (Complete Source Removal, Capping, and Subsidence Pit Disposal). The modifications to the original Alternative 4 include the remediation of all surficial mine waste accumulations at the Waco subsite by a combination of excavation, subaqueous mine waste disposal, consolidation with capping, and capping in place. Alternative 4A is identical to Alternative 4 at the other three subsites (Badger, Lawton, and Crestline). Alternative 4A addresses all waste accumulations inclusive of sediment, employs subaqueous mine waste disposal to the maximum extent practicable, and allows flexibility with regard to capping in place or consolidation and capping. It does not mandate the excavation of all materials or the use of sophisticated total infiltration-preventing cap designs as required by Alternative 6 nor does it prevent or minimize the use of subaqueous mine waste disposal as Alternatives 5 and 6 specify. It does not contemplate an ARARs waiver as Alternative 2 would likely require and it is an engineering solution as contrasted to Alternative 1, the No Action approach. It is expected that Kansas aquatic life criteria will be met by the actions prescribed by Alternative 4A and risks will be reduced in the most effective manner due to the flexibility of capping in place, consolidating and capping, excavating, and using subaqueous mine waste disposal, based on engineering efficiencies.

The remedial criteria for addressing surficial non-residential mining wastes is the visual presence of the materials, there are no specific action levels for the various heavy metals. This criteria is consistent with prior non-residential mine waste cleanups conducted at the Cherokee County site. The criteria for addressing sediments (non-surficial wastes) are threshold effects concentration (TEC) values from MacDonald et. al. (2000) that consist of the following action levels: cadmium = 0.99 ppm; lead = 35.8 ppm; and zinc = 121 ppm. Alternatively, site-specific sediment action levels may be established based on the determination of local non-mining impacted background reference sediment values subject to approval by the EPA with input from the KDHE and the U.S. Fish and Wildlife Service.

Certain limited areas of impacted sediment may not require removal based on the potential for destruction of critical habitat as indicated by prior use-attainability analyses conducted by the KDHE. Additional habitat assessment may be necessary during the design phase. Natural recovery will be employed for these relatively minor stream segments.

The specific elements of selected Alternative 4A include the following components for the Badger, Lawton, Waco, and Crestline subsites. Figures 4 through 7 depict the aspects of the selected alternative at each of the four subsites:

- Excavate, consolidate, and/or cap all surficial mine wastes and excavate metals impacted sediments from all ephemeral streams. Mining wastes in heavily forested, thickly vegetated areas will not be subject to excavating, consolidating, or capping.

- Utilize subaqueous mine waste disposal to the maximum extent practicable, with the exception of remedial actions at the Badger subsite due to the close proximity of the Spring River. For the Badger subsite, excavate mill wastes and dispose of materials in repositories located outside the limits of the 100-year flood plain of the Spring River.

- Cap subsidence pits, consolidation areas, tailings impoundments, and in-place chat/tailings areas utilizing topsoil and compacted clay caps with a minimum total thickness of 1.5 feet. The use of other materials in conjunction with soil, such as fly ash, is acceptable pending a successful assessment of viability.

- Re-contour and re-vegetate all disturbed areas and facilitate drainage and erosion controls. Construct sedimentation basins, detention ponds, dikes, berms, and swales to the extent necessary to control run-on and run-off.

- Abandon deep wells to prevent cross-contamination between the shallow and deep aquifers.

- Perform a design investigation to characterize the groundwater flow system in order to monitor the subaqueous mine waste disposal component of the remedy and to determine the need for groundwater institutional controls. County-wide institutional controls are addressed by other Cherokee County site decision documents and are not a component of this ROD.

- Assess the sediments of any water-filled shafts, pits, ponds, or collapse features not filled during the remedial action. Provide suitable cover, such as soil or rip rap, on near shore sediments that exceed numeric or site-specific criteria.

- Adopt the county-wide institutional controls from the Baxter Springs and Treece ROD, specifically, restrictions on new residential development in mine waste areas, controls on the drilling and design of new domestic water supply wells, and encouragement of local citizens to utilize existing rural water districts for domestic needs.

Based on the information currently available, the EPA, as the lead agency, and the KDHE as the supporting agency, believe the selected alternative optimally meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the selected alternative, Alternative 4A, to satisfy the following statutory requirements of CERCLA section 121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

The support agency, the KDHE, has been consulted in the preparation of this ROD, and has provided formal concurrence for the recommended cleanup alternative in this ROD. The U.S. Fish and Wildlife Service also supports the cleanup actions specified in this ROD. Additionally, certain aspects of the cleanup actions, such as the selection of a re-vegetation seed mixture, sediment removal and capping actions, and general remediation of surficial mining wastes, will be accomplished with U.S. Fish and Wildlife Service input in order to secure potential Natural Resource Damage (NRD) consideration granted by the U.S. Fish and Wildlife Service for the work performed under CERCLA. The intent is to conduct CERCLA response actions that return the site to a more natural condition and thus possibly convey substantial NRD consideration to those performing the work. The conveyance of NRD credits or consideration is not an EPA function; however, CERCLA response actions may be tailored in such a manner that the NRD Trustees (the U.S. Fish and Wildlife Service and the state of Kansas) may favorably assess the work in terms of natural resource restoration.

STATUTORY DETERMINATIONS

The EPA's primary legal authority and responsibility at Superfund sites is to conduct response actions that achieve adequate protection of human health and the environment. Section 121 of CERCLA also establishes other statutory requirements and preferences that include the need for federal and state ARARs compliance for selected remedial actions in addition to cost effectiveness and the use of permanent solutions and alternative treatment technologies, or resource recovery technologies, to the maximum extent practicable. Additionally, the statute includes a preference for remedies that reduce the mobility, toxicity, and volume of contaminants and include treatment. The following sections discuss how the selected alternative meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy will protect human health and the environment by achieving the RAOs through engineering measures. The institutional controls components of existing RODs will also complement the engineering controls specified by the selected alternative in terms of protecting human health.

Ecological risks resulting from exposure to mining wastes, heavy metals laden sediments, heavy metals impacted prey and food sources, and mining impacted surface waters will be addressed by the excavation, disposal, and capping of impacted sediments and the excavation, consolidation, subaqueous disposal, and capping of surficial mining wastes. Mining impacted sediments and surficial mining wastes will no longer be present and thus unavailable for uptake by ecological receptors. Near-shore sediments associated with ponds, pits, and collapse features (non-stream sediments) will be assessed for these features that are not filled as part of the remedy, and any impacted sediments will be capped (soil or rip rap) to prevent exposure. The ecological risks at OU-6 will be addressed by engineering controls as specified in the selected remedy.

Human health risks resulting from the exposure to mining wastes via the importation and use of the uncontrolled wastes in residential scenarios, trespassing in areas of mine waste accumulations, and residential construction in or near mine waste areas, will be prevented by the physical relocation, consolidation, subaqueous disposal, and capping requirements under the selected remedy. Mining wastes will no longer be present at the surface, and as such, the existing human health risks will be eliminated by engineering controls and the potential future risks will also be addressed by the engineering actions. O&M requirements for the capped areas will also serve as controls on future use. The institutional controls components of an existing ROD, when fully implemented, will limit, or control, residential development in or near mine waste areas and also control the drilling and use of new water supply wells in mined areas.

Potential groundwater risks to human health will also be addressed by the abandonment of deep wells that act as conduits to allow contaminants in the upper aquifer to migrate to lower pristine sources of water. The selected remedy will also provide characterization of the upper

aquifer in order to more clearly delineate any areas of impacted groundwater that may be subject to future institutional controls and to also assist in the evaluation of the effectiveness of subaqueous mine waste disposal.

Compliance with ARARs

In general, selected remedies are expected to comply with ARARs unless waivers are granted. The selected remedy is expected to meet all chemical-specific, action-specific, and location-specific ARARs and does not include any waivers.

Chemical-specific ARARs provide health or risk based concentration limits for contaminants in various environmental media such as sediment, groundwater, and surface water. The chemical-specific ARARs for groundwater and surface water and the risk based criteria for sediments and surficial mining wastes are discussed below.

- Safe Drinking Water Act (SDWA) - 42 United States Code (U.S.C.), National Primary Drinking Water Standards, Maximum Contaminant Levels (MCLs), 40 Code of Federal Regulations (CRF), Part 141, and the Kansas Administrative Regulations (K.A.R.) 28-15-13 for Safe Drinking Water are relevant and appropriate requirements for this response action. MCLs are standards promulgated for the protection of public drinking water supplies and these levels, in addition to the Kansas standards, are relevant and appropriate cleanup goals. The upper and lower aquifers at the site are used for drinking water purposes. The following depict the MCLs established by the SDWA and Kansas standards for lead (Pb) and cadmium (Cd): Pb action level at the tap = 15 parts per billion (ppb); Cd MCL = 5 ppb.

- Secondary MCLs and Maximum Contaminant Level Goals (MCLGs) - These standards are to be considered in implementing the remedy. Secondary MCLs and MCLGs are standards for public drinking water supplies that provide taste, odor, and aesthetic qualities. These are non health-based criteria, and as such, they are to be considered and were published in 50 Federal Register 36936.

- EPA Guidance Document, Cleanup Level for Lead in Groundwater (1/15/93) - This guidance to be considered recommends a final cleanup level of 15 ppb Pb in groundwater used for drinking water purposes and is consistent with SDWA and Kansas criteria. Groundwater at the subsites is used for drinking water purposes and lead is a contaminant of concern at OU-6. However, most residents of the subsites are served by rural water districts and the small number of households not supplied by rural water districts have not been found to have unacceptable water quality based on testing results.

- Clean Water Act (CWA) - The CWA, 33 U.S.C., requires states to establish surface water quality standards that are protective of human health and the environment. Many streams in the subsites are classified under the Kansas

standards, K.A.R. 28-16-28b et seq., and are subject to this criteria. The Kansas standards require that corrective actions be implemented to restore the designated uses of impaired surface waters as well as the return of original water conditions (K.A.R. 28-16-28(f)g). As part of this process, the state of Kansas has performed a Use Attainability Analysis (UAA) for certain stream segments at OU-6, and has developed Total Maximum Daily Loading (TMDL) limitations for certain OU-6 stream segments. The UAA and TMDL processes are relevant and appropriate requirements for this response action.

- MacDonald (2000) TEC or Background Sediment Criteria - Ecologically protective sediment criteria that are to be considered include the TEC values specified in MacDonald (2000). These criteria (Pb = 35.8 ppm, Cd = 0.99 ppm, and zinc (Zn) = 121 ppm), or alternative site-specific values to be developed in the future, constitute the recommended criteria for sediment removal based on ecological risks. The consensus-based TEC freshwater values represent the preferred set of critically evaluated values that have been demonstrated to accurately predict the absence of toxicity. The MacDonald criteria are contained in the following publication to be considered: MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater. Environmental Contaminants and Toxicology.

- Visual Presence of Surficial Mining Wastes - Historic analyses of mining wastes at the Cherokee County site, as well as from the larger Tri-State mining district, have shown elevated concentrations of heavy metals in mining wastes. This historic work has illustrated the commonality of wastes in the three state area and the commonality of health and environmental problems resulting from the presence of the wastes at the surface. The visual presence of surficial mining wastes is the criteria for removal under the selected remedy. This action is consistent with the approach to remediate surficial mining wastes at OU-3 and OU-5 of the Cherokee County site. These other operable unit response actions at the Cherokee County site are relevant and appropriate criteria for the current remedy at the nearby OU-6 subsites.

Location-specific ARARs establish restrictions on permissible concentrations of contaminants or establish criteria for conducting actions in sensitive locations such as flood plains, wetlands, streams, and areas of critical habitat. The location-specific ARARs are discussed below.

- Executive Order 11988, Protection of Flood Plains (40 CFR 6, Appendix A) - This is a legally applicable requirement for the response action given the presence of flood plains, especially the Spring River flood plain, at OU-6. The executive order requires that actions avoid adverse effects and minimize harm to flood

plains in addition to restoring and preserving the natural and beneficial values of flood plains to the extent possible. The OU-6 remedy is expected to comply with these requirements as the intent of the cleanup is to ultimately protect flood plains and streams by the removal of surficial mining wastes and impacted sediments.

- The Endangered Species Act (16 U.S.C., Section 1531, 50 CFR Part 200, 30 CRF Part 402, and the Kansas Non-game and Endangered Species Conservation Act, Kansas Statutes Annotated (KSA) 32-501) - These acts are legally applicable requirements due to the presence of several federal and state threatened and endangered species at the subsites. Threatened and endangered species, in addition to the habitat that supports these species, require protection and conservation. Moreover, consultation and coordination with the U.S. Fish and Wildlife Service and the state of Kansas will facilitate compliance with these requirements.

- Executive Order 11990, Protection of Wetlands (40 CFR 6, Appendix A) - This order is a legally applicable requirement due the presence of wetlands at OU-6 and it specifies the avoidance, to the extent practicable, of adverse impacts associated with the loss or destruction of wetlands resulting from response activities. The selected remedy is expected to comply with this requirement.

- The Fish and Wildlife Coordination Act (16 U.S.C., 40 CFR) - This requirement protects fish and wildlife from actions that may affect habitat, such as the removal of sediments from streams, and as such, is a legally applicable requirement for the OU-6 remedy. Federal and state threatened and endangered species, in addition to critical habitat, are present at the OU-6 subsites. Coordination with the U.S. Fish and Wildlife Service of the U.S. Department of the Interior, in addition to the state of Kansas, will facilitate compliance with this requirement.

- The U.S. Department of the Interior's Preliminary Natural Resource Damage Assessment (NRDA), as Natural Resource Trustee for the Tri-State mining district, is to be considered for the OU-6 remedy. The EPA and the Trustee have different but complimentary roles. The EPA is responsible for the development of response actions to protect human health and the environment. The NRDA is used to identify additional actions, beyond the EPA response, to address natural resources, including restoration of habitats or species diversity, or compensation for the loss of injured natural resources. The EPA will coordinate with the Trustee so that the site work, to the extent practicable and consistent with the selected remedy, to the extent possible, will enhance restoration of habitats and species diversity.

- The National Historic Preservation Act (16 U.S.C.), and the regulation at 33 CFR Part 800 - These requirements are to be considered and specify that response actions consider historic properties eligible for, or included on, the National Register of Historic Places. Although unlikely, some historic mining properties or structures may be deemed eligible and appropriate for preservation. The subsites are part of the historic Tri-State mining district that operated for over 100 years and is nationally and internationally known as a major Pb-Zn field.

- The National Archeological and Historic Preservation Act (16 U.S.C., and 36 CFR Part 65) - These requirements are to be considered and specify the recovery and preservation of artifacts which may be discovered during implementation of response actions. Although unlikely, the OU-6 response action may uncover prehistoric, Native American, scientific, or archeological information subject to preservation.

The action-specific ARARs are based on activities and technologies to be implemented at the subsites. Examples include design, construction, and performance requirements related to conducting the response action. The action-specific ARARs are discussed below.

- The National Pollutant Discharge Elimination System, Effluent Limitations (40 CFR parts 122, 125, and 440) - The regulation at 40 CFR, Part 440 sets technology-based effluent limitations for mine drainage from mining related point sources. The OU-6 response action may temporarily generate effluent; thus, the above criteria are relevant and appropriate requirements for the implementation of the OU-6 remedy. However, the substantive requirements of these regulations are expected to be met through engineering controls during implementation of the remedy.

- The Surface Mining Control and Reclamation Act (30 U.S.C., 30 CFR Part 816, Sections 816.56, 816.97, 16.106, 816.111, 816.116, 816.133, and 816.150) - These relevant and appropriate requirements provide guidelines for the post-mining rehabilitation and reclamation of surface mines. These requirements are expected to be met by the implementation of the remedy. Coordination and consolidation with the U.S. Department of the Interior will assist in meeting these requirements.

- Kansas Regulations (K.A.R. 28-30-1) - These requirements for construction, re-construction, and plugging of water wells are legally applicable for the OU-6 remedy since the response action may involve the abandonment of deep water wells and boreholes acting as conduits to the lower aquifer.

- Clean Water Act (Section 404, 33 U.S.C., 40 CFR Part 230, and 231) - These relevant and appropriate requirements prohibit the discharge of dredged or fill materials into wetlands without a permit. The OU-6 remedy includes placing mining wastes in water-filled features (pits, ponds, and collapses); thus, the substantive aspects of these requirements are applicable and expected to be met by the implementation of the remedy. The intent of the cleanup is to remove highly eroding wastes from the surface and place these materials in water-filled features below ground in an effort to prevent surface contact by human and ecological receptors and surface erosion to streams while establishing anaerobic groundwater conditions that prohibit the migration of metals in the groundwater system.

- Rivers and Harbors Act (Section 10, 33 U.S.C.), and related regulations 33 CFR 320, and Section 404 of the CWA, 40 CFR, Part 125, subpart M - These relevant and appropriate requirements prohibit the disposal of dredge and fill materials into streams without a permit. The OU-6 remedy includes actions near (excavation, consolidation, and disposal of mining wastes) and in streams (sediment removal) and is expected to meet the substantive requirements of these criteria. The remedy does not include direct placement of material into streams but care must be taken while working near streams to ensure that materials do not wash into these features.

- Deed Restrictions and Institutional Controls (K.A.R. 28-30 and KSA, 82a-1036) - The state of Kansas and local governments may need to facilitate these controls as part of the long-term O&M components of the completed remedy in order to protect the integrity of the capped mine waste areas and establish controls on the use of groundwater for consumption. Potential restrictions would include prohibitions on future residential development in mine waste disposal areas and water well construction requirements or prohibitions pending future assessment of groundwater quality. The subsite areas are currently rural and used for agricultural purposes thus lessening the potential future need for deed restrictions and institutional controls restricting development activities.

- CWA Regulations on Storm Water Discharges from Industrial Activities - These regulations are applicable because surface mining wastes contribute metals loading to surface water bodies as a result of runoff generated from infiltration events and erosion by streams. The OU-6 remedy is expected to meet these criteria by reducing water pollution resulting from run-off. The remedy will ultimately remove surficial mine waste materials available for erosion and the implementation of the remedy will be controlled to address runoff or releases during construction.

Cost Effectiveness

The selected remedy, Alternative 4A estimated at 7 million dollars, is a cost-effective permanent solution to mining wastes impacting the Badger, Lawton, Waco, and Crestline subsites of the Cherokee County Superfund site. The remedy relies on conventional engineering methods that are easily implemented and since all surficial wastes and contaminated sediments are fully addressed, it is a permanent solution not subject to excessive future re-opening costs or other potential future costs associated with toxic tort lawsuits. Additionally, the response action will return the areas to a more natural condition that may prove beneficial from a natural resource perspective.

The selected remedy is less expensive than the FS alternative (> 10 million dollars for Alternative 6) that addressed all surficial wastes via source removal and above ground disposal. The selected remedy (4A) is more expensive than Alternatives 4 and 5 (each estimated at 5 million dollars); however, these alternatives do not address all surficial mining wastes, and as such, these remedies would be subject to re-opening provisions, future NRD claims and litigation, and potential toxic tort lawsuits, related to the un-remediated accumulations of mining wastes. Additionally, the mining wastes not subject to remediation would rely heavily on the institutional controls components of an existing ROD which have not been enacted to date. Conversely, Alternatives 4A and 6 rely on permanent engineering controls, and since Alternative 4A (7 million dollars) is a cost-effective solution as contrasted to Alternative 6 (> 10 million dollars), it is deemed the most cost-effective, permanent solution for the OU-6 subsites. Alternatives 1 (No-Action, 0.5 million dollars) and 2 (Water Management and Erosion Controls, 3 million dollars) are less expensive than Alternatives 4, 4A, 5, and 6; however, these two alternatives would not meet ARARs, would leave a large amount of un-remediated wastes with exacerbated problems discussed above, and are not considered optimally protective.

The selected remedy (Alternative 4A) will achieve all RAOs, meet all ARARs, require no ARARs waivers, and may provide substantial future monetary gain or benefit by providing toxic tort relief. The remedy will also provide more suitable habitats for natural resources. Alternative 4A is especially cost-effective in consideration of the benefits derived in relation to reducing or eliminating future environmental or legal claims under other statutes or laws.

Utilization of Permanent Solutions and Alternate Treatment Technologies

As discussed in the above section dealing with costs, Alternative 4A is a permanent solution that relies on typical engineering controls. However, the potential unknown aspect related to permanence is associated with the potential release of metals to groundwater resulting from subaqueous mine waste disposal. While the relatively new technology is expected to be promising, it is not applicable under certain hydrogeologic conditions. Coupled with the uncertainties stemming from the recently completed pilot study at the Waco subsite, there is a possibility of future groundwater impacts. However, the novel subaqueous mine waste disposal technology is considered an alternative treatment technology that may prove highly useful at

many future projects. The potential environmental gains resulting from this alternate technology, coupled with the complete surface protectiveness and the return of farm land to productive agricultural use, has factored into the EPA's decision to implement this technology on a remedial scale.

In summary, Alternative 4A has a high degree of permanence associated with the removal and capping of sediments and surficial mining wastes, and has a potentially lesser degree of permanence, subject to monitoring, of the groundwater component of the filled pits. Alternative 4A utilizes an alternative treatment technology that may prove highly beneficial at future sites. The controlled implementation of a remedial scale project is desirable.

Preference for Treatment

The preference for treatment is not satisfied by Alternative 4A with regard to actions at the Badger subsite and may not be satisfied for actions at the Lawton, Waco, and Crestline subsites, pending future monitoring. The mining wastes at the Badger subsite are located in the flood plain of the Spring River, a major main-stem interstate river, and are thus not appropriate for subaqueous mine waste disposal technology due to concerns regarding potential impacts to the upper groundwater system. Mining wastes at the Badger subsite will be excavated and disposed in conventional soil repositories outside the limits of the Spring River flood plain. The large volume of wastes, and the potentially expensive methods to stabilize or treat mining wastes, result in the preference for treatment not being met at this subsite due to technical infeasibility.

Subaqueous mine waste disposal methods at the Lawton, Waco, and Crestline subsites may satisfy the preference for treatment pending an analysis of groundwater conditions following disposal. The historic pilot study conducted at the Waco subsite has not demonstrated geochemical modifications that could be considered treatment to date; however, monitoring is continuing and the literature supports the possibility of achieving geochemical changes (anaerobic conditions) which could be considered a form of treatment. In summary, Alternative 4A may not be capable of satisfying the preference for treatment at three subsites and the treatment preference will not be met at one subsite.

Reduction of Mobility, Toxicity, and Volume

Alternative 4A will reduce the mobility and toxicity of the contaminants of concern; however, the volume of waste materials will not be reduced. Mining wastes and impacted sediments will be excavated, consolidated, disposed, and capped, thus decreasing the mobility and toxicity of the wastes. The volume of the waste materials will be unaffected by the selected alternative.

Five-Year Review Requirements

The selected remedy is subject to periodic five-year reviews in accordance with Section 121 (c) of CERCLA and the NCP. Although mining wastes will be removed from the surface, and thus eliminated from potential uptake by human and ecological receptors, the wastes will remain at the site at elevated levels below the surface. Potential groundwater impacts stemming from subaqueous mine waste disposal will require monitoring and assessment as part of the five-year review process. Moreover, the O&M requirements for integrity and monitoring of the capped areas will require assessment during the five-year review process in addition to the status of institutional controls that are woven throughout the county by a prior ROD.

DOCUMENTATION OF CHANGES

The following changes were made to the ROD in response to input received during the public comment period following the release of the Proposed Plan.

- In response to comments received from the KDHE, and supported by the U.S. Fish and Wildlife Service, the EPA has incorporated into the ROD the characterization of near shore sediments in water-filled pits, ponds, and collapse features that are not filled with mining wastes as part of the cleanup action. If sediments in these features exceed numeric or site-specific ecological criteria, they will be capped or covered to prevent risks to waterfowl.

- In response to comments received from the Empire Electric District Company, the ROD has incorporated the potential use of fly ash materials, in conjunction with soil, to cap mining wastes. Additional assessment of the viability and economy of the product will be necessary during the design phase of the project.

- In response to comments received from Highland Environmental and Environmental Management Services Company, the ROD has been modified to better explain the primary focus on ecological risks at OU-6 as contrasted to lesser potential concerns related to human health risks.

- In response to comments received from Highland Environmental, the ROD has been clarified by additional information supporting the decision to fully address the surficial mining wastes and sediments at the OU-6 subsites.

- In response to comments received from Phelps Dodge Corporation, the ROD has been clarified to indicate the EPA's willingness to accept site-specific sediment excavation criteria pending coordination with the EPA, the KDHE, and the U.S. Fish and Wildlife Service.

- Institutional controls to be implemented throughout the county, as described in the OU-3/4 ROD, have been incorporated.

- In an attempt to discuss integration of the NRD process and potential consideration for parties conducting CERCLA response actions at OU-6, the ROD has incorporated information on this natural resource topic.

- All known mine wastes at OU-6 are considered to be erodible to streams and subject to remediation. If additional surface wastes are found in the future and determined by the EPA to be non-erodible, site-specific cleanup standards to address both ecological and human health risks will be developed by the EPA in consultation with the KDHE and the U.S. Fish and Wildlife Services.

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1. Responsiveness Summary

RESPONSIVENESS SUMMARY FOR THE RECORD OF DECISION
Badger, Lawton, Waco, and Crestline Subsites (OU-6)
Cherokee County Superfund Site
Cherokee County, Kansas

The responsiveness summary consists of the following three components: an overview of the public process; responses to verbal questions received at the public meeting; and responses to written correspondence received during the public comment period. This document is provided to accompany the Record of Decision and reflects input resulting from the Proposed Plan and public comment processes.

Overview

The Proposed Plan and supporting documents included in the Administrative Record were made available for public review and comment for 60 days from June 7 to August 6, 2004. The original 30-day comment period was scheduled to end on July 6, 2004; however, the period was extended an additional 30 days pursuant to a request by the responsible party group involved in historic work at the site. The responsible party group includes the following companies: E.I. du Pont de Nemours and Company (Dupont); NL Industries, Inc.; Phelps Dodge Corporation (formerly Cyprus Amax Minerals Company); and Sun Company, Inc. A public meeting was held in Columbus, Kansas, on June 22, 2004, with nearly 40 people in attendance. The transcript from the public meeting has been added to the Administrative Record.

A total of five letters were received during the 60-day public comment period from the following organizations: the Kansas Department of Health and Environment (KDHE); the Empire Electric District Company; Highland Environmental on behalf of NL Industries, Inc.; Phelps Dodge Corporation; and Environmental Management Services Company (EMS) on behalf of Dupont, NL Industries, Inc., and Sun Company, Inc. In general, the KDHE letter requested additional remedial enhancements to water bodies, the Empire letter requested consideration of the use of fly ash for cover materials, the Highland Environmental letter questioned the appropriateness of the proposed alternative and presumptive remedy process for the entire site, the Phelps Dodge Corporation letter questioned the cleanup criteria for the Crestline subsite, and the EMS letter questioned the proposed alternative for the Waco subsite. All letters received during the public comment period have been added to the Administrative Record.

Responses to Verbal Comments

Several verbal questions were asked at the public meeting following the formal presentation component of the meeting. The questions and associated responses are grouped for the individual posing the question. This summary provides generalized designations or affiliations for individuals asking questions. The detailed transcript of the public meeting has been added to the Administrative Record for the site.

Questions from a member of the Kansas House of Representatives - An elected state representative asked if the planned remedial actions in the Badger subsite would cause temporary detrimental impacts to the Spring River. The representative also asked if mining wastes at any of the subsites were currently being used for commercial purposes.

Responses to the State Representative's Questions - The proposed remedial action for the Badger subsite entails removal of mining wastes from the flood plain of the Spring River and does not include any active remediation work within the Spring River channel. The cleanup is not anticipated to have any short-term detrimental affects on the Spring River and will ultimately enhance water quality by alleviating the washing of mining wastes into the stream. There is no current commercial use of the surficial mining wastes in the Badger, Lawton, Waco, and Crestline subsites due to the rural setting of the wastes and the relatively small volumes that are present from a commercial standpoint.

Question from a Waco Subsite Land Owner - A local land owner asked if all of the open ponds, pits, and collapse features would be filled during the cleanup.

Response to the Land Owner - All of the surface water features will not be filled during the cleanup. Some water bodies are more desirable than others for filling with mining wastes based on water chemistry and hydraulic connections with the upper aquifer. Water bodies that are hydraulically isolated from the upper flow regime and exhibit anaerobic (low oxygen content) or high pH (not acidic) conditions are favored over the converse. The favorable conditions help to restrict the release of heavy metals into the groundwater system while the unfavorable conditions may promote or enhance the release of metals into the water system.

Questions from a County Resident Employed by the Empire Electric District Company - A county resident employed by the Empire Electric District Company provided the following input: the individual expressed safety concerns related to haul truck traffic; inquired if the quality of water in the Spring River would be impacted by the cleanup in any manner that would affect the use of the water by the Empire Electric District; and recommended the use of fly ash materials from the nearby Riverton, Kansas, plant be used in conjunction with soil for capping mining wastes.

Responses to the County Resident - Haul routes will be coordinated with the Cherokee County Engineer and the roads will be monitored for safety aspects. Safety is a major consideration and always a component of environmental cleanups, especially the heavy truck hauling routes and practices. The water quality of Spring River will not be impacted by the cleanup and will not cause issues with surface water requirements for operation of the Empire Electric District Company. The use of fly ash will be considered for capping the mining wastes in conjunction with soil, but that is a detail of the design process and may not be cost-effective or technically adequate compared to soil only.

Question from an Employee of the Oklahoma Department of Environmental Quality - An Oklahoma Department of Environmental Quality (ODEQ) representative requested that the future work on the Spring River basin be addressed on a basin-wide scale as opposed to actions keyed on state boundaries or various jurisdictions of the Environmental Protection Agency (EPA).

Response to the ODEQ Representative - It was acknowledged that greater coordination is always a goal and effort in this regard will continue and be enhanced over time. The recent work by the U.S. Army Corps of Engineers in the development of basin-wide plans for the Spring River and Tar Creek watersheds were discussed as examples of recent coordination. The Spring River is present in Missouri, Kansas, and Oklahoma, spans two EPA regional office jurisdictions (the EPA, Region 6 for Oklahoma and the EPA, Region 7 for Missouri and Kansas), three U.S. Fish and Wildlife jurisdictions, and three state environmental agencies. The remaining work at the Cherokee County site includes an evaluation of the surficial non-residential mining wastes at the Treece subsite (OU-4) and the evaluation of the Spring River within Kansas (OU-2). These efforts will be coordinated with all involved parties.

Questions from a Joplin Globe Newspaper Reporter - A reporter from the Joplin Globe asked the following questions: how many residential yards and private wells were sampled at OU-6; are responsible parties expected to fund the proposed cleanup; and has the EPA been approached by local land owners stating that the mining wastes are considered to have value and represent a source of income.

Responses to the Joplin Globe Reporter - All known users of private wells were sampled and the results indicated that there are no impacted private wells and the residential sampling indicated that no properties require residential cleanups. Less than 60 residential properties were sampled and less than 10 private wells were tested at the OU-6 subsites. The subsites are rural with a small number of homes in proximity to mining wastes and most of the area is served by rural water districts. It is anticipated that responsible parties will fund a portion of the proposed cleanup and remaining areas will be funded by the EPA with support from the state of Kansas. The exact details regarding funding and liability will be assessed at a later date with responsible party involvement. The EPA has not been approached by any local land owners asserting that the mining wastes are valuable and constitute a source of income. No subsite wastes are being commercially utilized due to the rural, inaccessible nature of most of the wastes and the relatively small volumes that would be useable on a commercial scale.

Question from a Cherokee County Resident Engaged in Farming - A local farmer stated the desire for remediated lands to be returned to productive agricultural use if possible and asked if this would be possible following the cleanup.

Answer to the Local Farmer - Much land will be returned to agricultural use; however, the entire area of mining wastes will not be available for farming practices. The large accumulations of mining wastes will be greatly consolidated, capped, and many ponds, pits, and

collapse features filled with wastes. These actions will reduce the footprint of the mining wastes and return a sizeable amount of ground back to farming uses. The filled pits, shafts, and collapses, as well as capped areas of mining wastes, will not be desirable for farming. The ground may remain somewhat unstable after filling the pits, shafts, and collapse features, and as such, may present hazards related to continued settlement and collapsing after being filled and thus not be appropriate for farming. To ensure capped areas remain viable, those areas cannot be farmed. In sum, more land will be available for farming than is available now.

Question from a NewFields Environmental Contractor - A contractor representing some of the responsible parties asked a question regarding the extent of dredging or sediment removal at the subsites under the proposed alternative.

Response to the Contractor - The sediment removal activities will take place in drainage ways and streams that convey water from the areas of mine waste accumulations to receiving streams. Many, but not all, of these features are ephemeral and they do not include large intra-state main stem rivers such as the Spring River. The full extent of sediment removal actions will be determined during the pre-design or design phases pending the use of background or existing numeric standards for sediment removal.

Responses to Written Correspondence

KDHE Letter - The KDHE participated in the development of the Proposed Plan and provided written concurrence supporting the proposed cleanup plan prior to the public comment period. The KDHE submitted an additional comment during the public comment period requesting additional actions to cap or cover mining wastes in water-filled ponds, pits, or collapse features that remain on-site following the remedial action. This additional effort was requested in order to protect migratory birds from exposure to heavy metals while feeding on the near-shore bottom sediments of these surface water bodies.

Response to the KDHE Letter - The cleanup plan will be modified to include sampling of near bank sediments in mining ponds, pits, and collapse features not proposed for filling during the remedial action. If these areas exceed ecological based risk criteria, MacDonald (2000) threshold effects concentration (TEC) numeric values or background concentrations, some type of cover, such as soil or rip-rap, will be placed in these areas to provide protective cover for migratory birds. It should also be noted that this action may satisfy natural resource concerns of the U.S. Fish and Wildlife Service and result in a cover material that is protective of migratory birds.

Empire Electric District Company Letter - The Empire Electric District Company suggested the use of fly ash and bottom ash from their plant in Riverton, Kansas, for use in conjunction with soil to cap mine waste areas. The company further stated that the plant is in close proximity to the cleanup areas and the action would reduce landfill disposal of this product in Cherokee County. Toxicity Characteristic Leaching Potential (TCLP) analyses of the ash products were also provided as an attachment to the letter.

Response to the Empire Electric District Company Letter - The cleanup plan will be modified to potentially allow for the use of ash materials from the Empire plant for capping purposes in conjunction with soil. This action would result in the use of less soil, potentially result in cost savings related to the use of ash, and reduce the need to landfill the ash material in Cherokee County. Additional tests for other parameters will likely be required in order to more fully assess the viability of this product for use with soil to cap mining wastes. It should be noted that the U.S. Fish and Wildlife Service has historically recommended additional assessment of ash materials in order to more fully evaluate their suitability as capping materials. The remedial design phase will more fully explore the use of the product. The EPA appreciates the TCLP data and the offer of the ash materials for the cleanup. The materials will require a more detailed assessment of economic and technical viability during the design phase of the project.

Highland Environmental Letter - This letter on behalf of NL Industries, Inc. alleges that the proposed cleanup is inconsistent with the National Contingency Plan (NCP), deviates from the terms of an Administrative Order on Consent (AOC), does not follow the presumptive remedy process, and does not include various risk assessments. Additionally, the letter volunteers the performance of a risk assessment by NL Industries, Inc., states that the Administrative Record is deficient, and recommends that the cleanup not be conducted.

Response to the Highland Letter - The EPA believes the proposed cleanup is consistent with the NCP and feels the presumptive remedy process was followed under the AOC. The EPA will not require additional risk assessment work prior to remedy selection and implementation and believes the proposed cleanup is supported by the Administrative Record. The following bulleted items respond in greater detail to general themes or points contained in the Highland Environmental letter.

- AOC and Presumptive Remedy Process - Under the terms of the AOC (U.S. EPA Docket No. CERCLA-7-99-0002), the respondents (Cyprus Amax Minerals Company, Dupont, NL Industries, Inc., and Sun Company, Inc.) agreed to conduct a focused remedial investigation and presumptive remedy feasibility study (RI/FS) at OU-6 based on prior work conducted at the Baxter Springs and Treece subsites (OU-3/4) of the Cherokee County Superfund site in Cherokee County, Kansas. The RI did not require the performance of human health and ecological risk assessments, or extensive site characterization and chemical analytical sampling and analysis, due to the fact that many operable units of the Cherokee County site have been extensively sampled and risks have been characterized, although human health and ecological risks are continuing to be assessed on an ongoing basis by organizations inclusive of the U.S. Fish and Wildlife Service, the U.S. Geological Survey, the Agency for Toxic Substances and Disease Registry, the EPA, and the KDHE. The completed RI was clearly focused and streamlined to support a presumptive remedy approach. It did not include extensive sampling, or the performance of risk assessments by intent, and was conducted in accordance with the AOC. Following completion of the RI, the FS was conducted and ultimately expanded beyond the limits of a presumptive remedy approach at the request of

the responsible parties; specifically, the request to include subaqueous mine waste disposal as a potential remedial alternative. This alternative was not a component of the historic Baxter Springs and Treece FS, and as such, has no basis for inclusion in a presumptive remedy FS based upon the FS for the Baxter Springs and Treece subsites. Additionally, this technology has no basis in any of the many completed remedial actions at various operable units and subsites within the Cherokee County site. The EPA did not initially agree to this presumptive remedy modification; however, after repeated requests by the responsible parties and following the performance of a preliminary subaqueous mine waste disposal pilot study conducted at the Waco subsite, the EPA, with concurrence of KDHE, agreed to allow the deviation to occur at the request of the responsible parties. As the FS process unfolded, the EPA requested an expansion of the FS to include more comprehensive cleanup approaches that were in accordance with approaches contained within the Baxter Springs and Treece FS. The respondents were offered an opportunity to terminate the AOC and not continue the FS process if they believed the suggested expansion of the document was beyond the bounds of the presumptive remedy process. Tables and text from the Baxter Springs and Treece FS were provided to the respondents during an FS meeting for assessment and decision-making purposes regarding completion of the FS document and further work under the AOC. The respondents voluntarily continued the FS process under the AOC. There are no proposed cleanup alternatives in the OU-6 FS that significantly differ from the Baxter Springs and Treece FS alternatives, with the exception of the subaqueous mine waste disposal components of various remedies which were sought by the responsible parties. In summary, the EPA believes that the AOC was appropriately conducted by the responsible parties and a focused RI and presumptive remedy FS resulted from the work.

- Risk Assessments and Administrative Record - Under the terms of the AOC, the EPA, by conscious intent, did not require the completion of human health or ecological risk assessments at this operable unit of the site. There is a wide body of site characterization and risk assessment data contained within the various Administrative Record files for the many cleanups that have been conducted at the several operable units and subsites of the Cherokee County Superfund site. These Administrative Records are incorporated into the Administrative Record for OU-6 (the Badger, Lawton, Waco, and Crestline subsites) by reference, and as such, constitute an adequate Administrative Record for the proposed remedy. As an illustration pertaining to a human health risk assessment issue raised in the Highland Environmental letter, the Integrated Exposure Uptake Biokinetic (IEUBK) model for lead in children was run for OU-7 (Galena Residential Soils) and the results were used to establish the residential criteria for the entire Cherokee County Superfund site due to the close proximity of the various operable units and subsites as well as the similarity of physical and contaminant conditions across the site. Accordingly, the EPA has made risk management decisions pertaining to the site as a whole and does not plan to repeatedly run the

IEUBK model or conduct multiple human health and ecological risk assessments for different areas of the same site that are in close geographic proximity to one another and exhibit similar waste characteristics. The Administrative Records pertaining to these various cleanups are incorporated by reference into the Administrative Record for OU-6 and are available for review in Cherokee County, Kansas, and at the EPA's office in Kansas City, Kansas. Specific Administrative Records in Cherokee County associated with past cleanups are available for review at the following locations: OU-3/4 (Baxter Springs and Treece subsites) at the Johnston Public Library in Baxter Springs, Kansas; OU-1 (Galena Alternate Water Supply), OU-5 (Galena Groundwater and Surface Water), and OU-7 (Galena Residential Soils) at the Galena Public Library in Galena, Kansas; and OU-6 (Badger, Lawton, Waco, and Crestline subsites) at the Columbus Public Library in Columbus, Kansas. With regard to remedy selection, the EPA has selected an alternative (4A) that specifies actions wholly contained within the final presumptive remedy FS report, and that report is contained within the Administrative Record file. Alternative 4A does not specify any cleanup actions that are not a component of the FS report and is thus not an arbitrary and capricious decision, but rather a decision based upon the record and consistent with the NCP.

- Selected Alternative 4A and the RI/FS Process - Alternative 4A was drafted by the EPA with support of the KDHE and the U.S. Fish and Wildlife Service as based on the range of alternatives provided in the presumptive remedy FS. Likewise, the selected alternative for the Baxter Springs and Treece subsites, Alternative 3b, was drafted by EPA with support of the KDHE and based on the range of alternatives provided within the OU-3/4 FS. The process of remedy selection for OU-6 is thus in accord with the process used for OU-3/4. The OU-6 proposed alternative (4A) specifies actions that are clearly components of the completed focused FS report. There are no actions, or any aspects of any actions, mandated by this remedy that are not included as possible remedy components in the focused FS report with the exception of the use numeric sediment criteria and assessment/potential mitigation of non-stream sediments. Furthermore, the proposed alternative has lesser requirements and is less costly than Alternative 6 in the focused FS report, and thus falls within a potential range of actions specified in the FS. The intent of the FS process is to arrive at a range of alternatives suitable for ultimate selection. The FS process does not recommend a specific alternative, but rather provides a range of potential alternatives that may be appropriate for the site. The range of alternatives may be modified by the selecting agency into a preferred alternative as is commonly the case. The EPA is the selecting agency, remedy selection is an inherently governmental function that is not performed by the responsible parties. The EPA coordinates remedy selection with the state (KDHE), as was the situation for the OU-6 remedy, as well as other federal agencies such as the U.S. Fish and Wildlife Service in this

example. The remedy selection process differs from the RI/FS process, since it is an agency function, and as such, the EPA, with support of the KDHE is responsible for developing the optimum cleanup approach. In general, selected alternatives may not always consist of one of the precise approaches discussed in an FS report.

- Cleanup Standards and Remedy Enhancements at OU-6 contrasted to OU-3/4 - The Highland Environmental letter questions the appropriateness of the proposed remedy for OU-6 as compared to OU-3/4 and references the lack of cleanup standards for non-residential mining wastes in OU-6 Alternative 4A. The selected alternative for OU-3/4 also did not include specific cleanup standards for non-residential mining wastes, the criteria was the visual presence of the wastes and this same criteria is utilized at OU-6 for non-residential mining wastes with the exception of sediments. New sediment criteria consisting of MacDonald (2000) TEC numeric values, or site-specific background values to be determined in the future if desired, are specified in the proposed alternative for OU-6 in lieu of visual standards. The EPA and the KDHE conducted sampling and analysis of sediments in the Lawton subsite and found appreciable concentrations of heavy metals (zinc values greater than 1,700 parts per million or ppm) in sediments that exhibited no visual indication of impact. The data and information are contained within the Administrative Record and illustrate the potential ecological issues associated with non-numeric criteria for sediments. Moreover, recent bird studies conducted by the U.S. Fish and Wildlife Service indicate potential mining sediment impacts to various bird species. The published studies are contained within the Administrative Record and the U.S. Fish and Wildlife Service, the KDHE, and the U.S. Geological Survey are in the process of planning and conducting additional more definitive bird studies in the Tri-State mining district, inclusive of the Cherokee County site. The numeric sediment criteria (MacDonald, 2000, TEC values) were recommended by the EPA, Region 7 ecological risk assessment staff, the KDHE, and the U.S. Fish and Wildlife Service. An additional remedy enhancement at OU-6 is the inclusion of all surficial mining wastes for remediation. This approach was also taken at OU-5 (Galena Groundwater and Surface Water) of the Cherokee County site and is thus fully consistent with a historically completed cleanup at the site but is more comprehensive than the historic approach at OU-3/4 (Baxter Springs and Treece subsites) of the Cherokee County site. The OU-4 cleanup is subject to re-opening provisions under the Consent Decree (Civil Action No. 99-1399-WEB) for this work and the effectiveness of the recently completed (2004) OU-3 cleanup is currently being studied and is thus at a premature stage for remedy assessment (the operation and maintenance plan is currently under final revision). A multi-year ecological study by the University of Kansas, Biological Survey, of the OU-5 remedy has shown ecological improvements, recently published bird studies indicate additional risks associated with mining impacted surficial and sediment

wastes, and recently completed use attainability analyses (UAAs) at OU-6 conducted under the total maximum daily load (TMDL) program, collectively illustrate the need to more fully address wastes at this operable unit. The Administrative Record contains UAA and TMDL information, many comments related to numeric sediment criteria, and information related to the desire for holistic, comprehensive remedies that are consistent with prior cleanups conducted at the site.

- Preference for Holistic Remedies that are Compatible with the U.S. Department of the Interior Natural Resource Damage (NRD) Actions and Other Statutes - The Highland Environmental letter requests additional clarifying information pertaining to the recommended cleanup at OU-6 and inquires about the viability of the past OU-3 cleanup. Under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), the EPA has an obligation to work with natural resource trustees to ensure that Superfund remedies consider NRD criteria and are consistent with holistic environmental solutions. Likewise, the EPA Superfund and Water programs (specifically the TMDL program in the OU-6 situation), as well as other environmental statutes and programs, are committed to holistic cross-statute environmental solutions that are protective of the environment on a drainage basin or watershed scale. Lastly, the state of Kansas as represented by KDHE, has a strong desire for future environmental remedies that are holistic. Thus, while the EPA has not determined that the Baxter Springs remedial action is deficient, the waiving of surface water criteria and the establishment of alternate toxicity reference values (TRVs) are not contemplated for future remedies at the Cherokee County site and were not contemplated for the OU-6 remedy as discussed during many early FS meetings conducted under the AOC. Several written comments contained in many letters within the Administrative Record discuss this point. The responsible party group was provided an opportunity to terminate the AOC following completion of the RI, but voluntarily chose to continue work on the FS in view of the EPA's consideration of approval of the inclusion of a non-presumptive remedy (subaqueous mine waste disposal technologies) in various alternatives. The NRD and TMDL programs were not fully engaged at the Cherokee County site during the remedy selection process for OU-3/4, this situation has clearly changed and is relevant to the OU-6 remedy. The historic OU-5 cleanup, which predated the OU-3/4 cleanup, provides a basis for addressing all surficial mining wastes, and since the remedy has been in place for a number of years it has also undergone an ecological assessment that cannot be performed in Baxter Springs at this time due to the recent completion of that work. As previously mentioned, the remedy selection process differs from the RI/FS process. The EPA has, with the support of the KDHE and the U.S. Fish and Wildlife Service, considered the holistic nature of environmental protection in the proposed alternative for OU-6, and that alternative is contained within the presumptive remedy FS for the site.

- Residential versus non-Residential Cleanups - The Highland Environmental letter references the Superfund Lead-Contaminated Residential Sites Handbook as justification to not remediate rural mining impacted lands. This handbook is applicable to residential cleanups but is not appropriate guidance for ecological mine waste cleanups that are typically focused on remote, undeveloped, lead-contaminated land. The major concern with rural mining waste accumulations at OU-6 does not entail real estate development in these areas but is predominantly the ecological risks associated with surficial accumulations of mining wastes and the possibility of this material being utilized in residential applications as fill or landscape materials. New construction and trespassing are considered lesser threats, the EPA has made changes to the Record of Decision to better discuss the human health risks in response to input provided in the Highland Environmental letter. The high levels of zinc are the primary risk drivers for ecological receptors. The EPA is not contemplating significant residential development in the area but is rather more concerned with the ecological risks resulting from the high zinc levels in the surficial mining wastes. The Waco subdistrict is noted for its high zinc production and the mining wastes in this area are more enriched with zinc, as opposed to lead, and represent some of the more concentrated zinc wastes within the Tri-State mining district. As an example, fish tissue samples from the OU-6 subsites contain higher levels of zinc than similar samples analyzed at the OU-3/4 subsites in Kansas and the Jasper County site in Missouri. Human health risks may be deemed to be of less potential importance than ecological risks at OU-6 and basically include the use of mine waste materials in residential settings, outdoor activities in mine waste areas, and possible residential development. The EPA acknowledges that outdoor activities and residential development are not highly probable (modifications made in the Summary of Site Risks portion of the Record of Decision and information added to the Current and Potential Future Land Use and Resource Uses section) but the future potential human health risk does exist in combination with ecological risks.

- Validity of Selected Alternative 4A - Alternative 4A is a modification of Alternative 4 which is contained within the FS report. Alternative 4A is exactly the same as Alternative 4 with regard to cleanup actions at the Badger, Lawton, and Crestline subsites but differs from Alternative 4 at the Waco subsite by requiring all surficial wastes to be addressed (essentially 100 additional acres from the Alternative 4 criteria). Alternative 6 of the final FS report also requires all surficial wastes to be addressed at the Waco subsite in addition to sophisticated engineered cap designs and a preference for capping as opposed to subaqueous mine waste disposal. Alternative 6 does not allow subaqueous mine waste disposal at any other subsites (Badger, Lawton, and Crestline) and only allows a limited amount for the Waco subsite. All active remedies preclude subaqueous mine waste disposal at the Badger subsite due to the close proximity of the Spring

River. Alternative 4A does not include any actions not prescribed by the FS report, with the exception of numeric sediment criteria and potential non-stream sediment mitigating, and in fact specifies the exact same actions as Alternative 4 for the Badger, Lawton, and Crestline subsites, thus the nomenclature for this alternative was correctly designated as 4A, a modification of Alternative 4. Alternative 6 precludes subaqueous mine waste disposal in all areas with the exception of a limited amount in the Waco subsite, specifies a full areal mine waste cleanup in Waco, and utilizes sophisticated, engineered cap designs. The selected alternative (4A) resulted from the presumptive remedy FS, with minor exceptions, and the FS is contained within and supported by the Administrative Record for the site.

Phelps Dodge Corporation Letter - The Phelps Dodge Corporation letter is specific to the Crestline subsite and questions the use of numeric sediment criteria, describes subsite streams as having poor quality habitat, and mentions other potential contributors to the environmental problems observed at the site. The letter also offers to conduct additional sampling activities and indicates the belief that aquatic life at the subsites has not been adversely impacted. Lastly, the letter mentions potential allocation assessments for cleanup actions under the proposed alternative.

Response to the Phelps Dodge Corporation Letter - Many of the points have been addressed by the above responses to the Highland Environmental letter. The following bulleted items respond more fully to the concerns raised in the Phelps Dodge Corporation letter and are grouped by subject area for ease of interpretation.

- Numeric Sediment Criteria - It is acceptable to the EPA to determine site-specific background sediment criteria in lieu of MacDonald (2000) TEC criteria if desired. Any new proposed criteria will be subject to coordination with the EPA, the KDHE, and the U.S. Fish and Wildlife Service. As mentioned previously in the Highland Environmental response, the numeric sediment criteria were recommended by internal EPA, Region 7 ecological risk assessment staff, ecological risk professionals from the KDHE, and the U.S. Fish and Wildlife Service. Additional information discussing the rationale for numeric based values as opposed to visual methods is contained in earlier responses - historic sampling has shown elevated levels of contaminants in sediments that did not appear to be visually impacted. The EPA believes that numeric sediment criteria are necessary as opposed to visual methods and is willing to consider alternate proposed criteria during the remedial design or remedial action phases. A design investigation study may be the appropriate time frame for such a determination if desired.

- Quality of Habitat at the Subsite - The quality of the habitat in the Crestline subsite is higher than illustrated by the Phelps Dodge Corporation letter as based on information contained within the Administrative Record inclusive of the

results of the UAAs that were conducted by KDHE. These field-based UAA studies assessed the habitat in many of the OU-6 subsite streams and the findings included the support of a diverse and vital ecosystem in many instances. Review comments from the KDHE on the RI reports also contain much information regarding habitat characteristics at OU-6. As an example, RI comments from KDHE (December 22, 1999, letter from Mr. Leo Henning) indicate that the Spring River near the Crestline subsite has habitat development index (HDI) scores that are among the highest ever recorded in Kansas and the river is designated in the Kansas surface water quality standards as a special aquatic life use water and an exceptional state water. In addition to some of the highest HDI scores ever recorded in Kansas, the Kansas Department of Wildlife and Parks has designated the Spring River as critical habitat for five threatened and endangered (T/E) fish species, six T/E mussel species, and has classified the river as a highest-valued fishery resource. Additionally, the National Park Service has classified the Spring River as an outstanding, remarkable stream for fishing, recreational, scenic, and wildlife attributes. In summary, the Spring River and associated water bodies are considered valuable and precious surface water resources. The Administrative Record contains UAA and TMDL information in addition to the KDHE comments related to habitat quality.

- Other Potential Contributors to Environmental Degradation - The EPA acknowledges the contribution of other sources of contamination as mentioned in the Phelps Dodge Corporation letter; however, we continue to believe that the most significant heavy metal impacts to the ecosystem are a result of past lead-zinc mining in the Tri-State mining district. The lead-zinc mining impacts to the environment have been well established through a multitude of scientific and engineering studies conducted in all three states (Kansas, Missouri, and Oklahoma) comprising the former Tri-State mining district by a large number of diverse organizations.

- Allocation Assessments - The EPA appreciates the early discussion of liability in preparation for future cleanup negotiations with responsible parties, but this information is not relevant to the selection of the appropriate remedy for the OU.

EMS Letter - The EMS letter recommends that the proposed alternative be withdrawn in favor of Alternative 4, questions the nomenclature and NCP support for the proposed alternative (4A), and states concerns related to the EPA's ability to fund the cleanup. The letter includes an attachment from NewFields, on behalf of EMS, with supporting information on the same general topics.

Responses to the EMS Letter - The EPA has selected Alternative 4A as embodied in the accompanying Record of Decision for OU-6 and believes that this approach is appropriately named and optimally meets NCP criteria. The EPA's ability to fund cleanups is not a relevant topic for discussion. The following bulleted items, in addition to earlier responses to other letters, address the major points contained within the EMS letter and attachment.

- Selection and Designation of Alternative 4A - The EMS letter indicates that a specific remedy, namely Alternative 4, was recommended in the FS and further states that Alternative 4 substantially differs from Alternative 4A and is essentially Alternative 6. In actuality, the FS does not recommend a specific alternative, but rather provides a potential range of alternatives from which the selecting agency (the EPA) may choose, or modify, as necessary. The EMS letter incorrectly implies that a certain "remedy" was recommended in the FS process. The goal of the FS process is expressly to not recommend a specific approach but rather to provide a range of potential options for consideration by the selecting agency. The work required by Alternative 4A clearly fits within the range of possible FS options, this point is also discussed in earlier comment responses. Prior responses to other letters also elaborate on the distinctions and goals of the FS process as contrasted to the remedy selection process, the relationship between the FS process and remedy selection, and the authority and goals of remedy selection. With regard to the designation or naming of Alternative 4A, this remedy requires identical remedial actions at the Badger, Lawton, and Crestline subsites as Alternative 4 and only differs from Alternative 4 at the Waco subsite by the inclusion of approximately an additional 100 acres of mining wastes to be addressed. Alternative 4A is thus correctly named, as it is identical to Alternative 4 in every respect with the exception of an increase in the area of wastes to be addressed at the Waco subsite. In contrast, Alternative 6 requires different actions than Alternative 4 at three subsites (the Lawton, Waco, and Crestline subsites). All active remedies preclude subaqueous mine waste disposal at the Badger subsite. Alternative 6 prohibits the use of subaqueous mine waste disposal at the Lawton and Crestline subsites, minimizes the amount of subaqueous mine waste disposal to the extent practicable at the Waco subsite, and favors the use of highly sophisticated, engineered caps at all subsites. Alternative 6 is also much more costly than Alternatives 4 and 4A, and thus is clearly a different remedial approach, especially considering the required preclusion of subaqueous mine disposal methods.

- NCP Support for the Proposed Alternative - The EMS letter indicates that the contaminants of concern at OU-6 are generally lower in concentration than those found at OU-3/4. While lead values may be lower as based on a relatively small amount of sample data, zinc values are in fact much higher at OU-6 than OU-3/4 and represent some of the most elevated zinc values observed within the 2,500 mile span of the Tri-State mining district. As discussed in a prior comment response, fish tissue samples from OU-6 contained higher levels of zinc than were observed in similar samples from Jasper County, Missouri and other Cherokee County, Kansas, subsites. The Waco area was especially noted for its zinc reserves during periods of active mining. Since zinc is the primary driver of ecological risks, these elevated levels present additional concerns related to ecological risks, especially in light of the recently released zinc toxicity bird studies and NRD claims for the Cherokee County site. The EPA and the KDHE

provided review comments on past draft reports discussing the elevated nature of zinc data at OU-6 as contrasted to OU-3/4 and this information, as well as relevant bird zinc toxicity studies, are contained within the Administrative Record for the site. The EMS letter repeatedly indicates that a certain remedy was mandated by the AOC and discusses certain future remedial action funding agreements made by the EPA in exchange for the respondent's agreement to consider a subaqueous mine waste disposal approach. The EPA has made no such funding commitments for future remedial allocations as part of the AOC process and only agreed to consider subaqueous mine waste disposal remedial alternatives at the request of the respondents. The Administrative Record clearly contains EPA's initial comments refusing the respondent's proposals for a subaqueous mine waste disposal approach. The EMS letter misrepresents the AOC process and agreements that were reached during that time frame. As previously discussed, remedy selection is an EPA function that is separate from the AOC process. Moreover, the EMS letter states that the EPA and the KDHE do not believe that Alternative 6 is more protective than Alternative 4; however, the Administrative Record includes many comments by the EPA and the KDHE that clearly indicate a higher level of protectiveness, in our collective view, associated with remedies that employ more stringent criteria.

- Site Risks and Remedy Effectiveness - The EMS letter states that human health risks do not exist at OU-6 and that a range of remedies, Alternatives 2 through 6, provide equal protection, and as such, the least expensive remedy should be selected. The EPA, the KDHE, and the U.S. Fish and Wildlife Service do not believe that the range of potential alternatives (2 - 6) offer equal protection of the environment. Given the large differences of mine waste materials addressed by the range of remedies, and the fact that mine wastes are hazardous, the removal of greater volumes of mining wastes provides greater protection of the environment and is in concert with NRD goals and criteria. The EMS letter indicates that the OU-3/4 Ecological Risk Assessment determined that the potential risks to terrestrial receptors were determined to be "low" and adequately addressed by the OU-3/4 remedy which included the use of TRVs in lieu of state standards (waivers required). In fact, the OU-3/4 Ecological Risk Assessment determined that risks were unacceptable (toxicity quotients > 10 in some instances, a value greater than 1 indicates unacceptable risk), state water quality standards were waived, and TRVs for lead, cadmium, and zinc were established at levels equivalent to lethality in 50% of the affected population (concentration values known as an LC50, lethal to the species in question approximately 50% of the time). Since Alternative 2 is a similar remedy to the OU-3/4 approach, and water standards are not contemplated to be waived and TRVs will not be established, the EPA does not believe that Alternative 2 would offer the same degree of protectiveness as the total mine waste removal approach (Alternative 6). Likewise, successive remedies that remove greater volumes of wastes will result in greater protectiveness. In regard to human health risks, the EPA agrees that

human health risks are not as severe as ecological risks and did include a discussion indicating that residential properties do not require remediation and groundwater supplies currently known to be utilized are not impacted. Although the potential for development is low, there is a potential for such action as well as the potential for use of the surficial wastes in residential applications since the areas are not secured. The high zinc levels and ecological impacts are the primary risk drivers for the OU-6 cleanup. The EPA has added clarifying language on this point in the Record of Decision (Summary of Site Risks and Current and Potential Future Land Use and Resource Uses Section) in response to input in the EMS and Highland Environmental letters.

- Release of draft Natural Resource Damage Assessment (NRDA) Report - The draft NRDA for the Cherokee County site was released for public review during the period of August 13 to September 13, 2004, and has been incorporated into the Administrative Record file for OU-6. The Trustees (the U.S. Fish and Wildlife Service and the state of Kansas, KDHE) are currently developing a responsiveness summary for the comments received. This NRD assessment provides further support for the increase in ecosystem protectiveness as a result of addressing a greater extent of mining wastes.

- Release of Tar Creek and Lower Spring River Watershed Management Plan by the U.S. Army Corps of Engineers - A reconnaissance phase, draft plan for addressing mining impacts within the Spring River and Tar Creek drainage basins has been released by the U.S. Army Corps of Engineers as a multi-agency effort (U.S. EPA, U.S. Army Corps of Engineers, U.S. Department of the Interior) aimed at addressing mining wastes remaining in the Tri-State mining district. This effort and plan continue to support the need to address all surficial wastes within the district. This plan does not recommend that wastes remain in place, the ultimate goal is the removal or remediation of all mining wastes and sediments within the former mining district. The plan recommends the initial removal or remediation of all mining wastes within 100-year flood plains and all impacted sediments followed by removal or remediation of all mining wastes within the Tri-State mining district. The plan emphasizes a "holistic" response to address the myriad environmental issues within the former mining district and discusses the need for comprehensive solutions that ultimately address all sediments and surficial mining wastes. National Environmental Policy Act (NEPA) strategy for the entire Tri-State mining district is discussed in the plan in addition to natural resource issues. Natural resource and NEPA strategies cover all three states (Missouri, Oklahoma, and Kansas) and acknowledge downstream impacts and re-contamination issues for Oklahoma as a result of actions in Kansas and Missouri and for Kansas and Oklahoma with regard to impacts from Missouri. Moreover, the plan discusses the upstream environmental impacts from Kansas and Missouri that threaten tribal lands in downstream portions of Oklahoma. The Spring River receives mining impacts from wastes within Missouri and Kansas and these

impacts ultimately accumulate in the Grand Lake O' the Cherokees in Oklahoma, the final receiving water body. Similarly, Tar Creek is impacted by upstream mining wastes in Kansas prior to flowing south to Oklahoma where additional impacts are added prior to discharge to the Neosho River and then to the Grand Lake O' the Cherokees. Surficial mining wastes and sediments in the upstream states of Missouri and Kansas are specifically identified as issues for downstream tribal and state lands in Oklahoma and include many receiving bodies such as the Spring River, Tar Creek, Lytle Creek, Neosho River, and Grand Lake O' the Cherokees, all within the state of Oklahoma. The recommended actions resulting from the multi-agency watershed management plan for the Tri-State mining district support the EPA, Region 7 decision to implement a comprehensive holistic approach at OU-6. The U.S. Army Corps of Engineers draft watershed management plan for the Tri-State mining district has been added to the Administrative Record.

- Historic Mine Waste Cleanup at OU-5 (Galena subsite) of the Cherokee County site - The EPA historically remediated (1995 completion) all surficial mining wastes at the Galena subsite (900 total acres) within the Cherokee County Superfund site. This past cleanup also provides a foundation for comprehensive remedies that address all surficial accumulations of mining wastes at the Cherokee County site. Subsequent ecological studies (University of Kansas, Kansas Biological Survey) have indicated environmental gains resulting from this cleanup. The EPA believes there is much foundation and basis for selecting comprehensive cleanup approaches and notes that the selected alternative for OU-6 includes actions specified within the FS for the site.

- Toxic Tort Lawsuits and Ongoing Human Health Risks - The EPA notes the recent announcement (July 2004) of additional multi-million dollar lawsuits directed toward responsible parties for environmental harm to children as a result of former mining operations in the Tri-State mining district. Many prior lawsuits, as well as the current round of future litigation, again illustrate the ongoing human health issues associated with surficial mining wastes in the Tri-State mining district. The EPA believes that these actions further support the need to address all surficial mining wastes at the Cherokee County site and also illustrate the views of the general public regarding mining wastes and the environment. Current and historic toxic tort information has been added to the Administrative Record in a September 2004, addendum. All additions to the Administrative Record are contained within this addendum that further supports the ROD for OU-6.

- Permanence, Reliability, and Costs of Alternative 4 - The EMS letter indicates that Alternative 4 is the preferred approach due to its superior permanence and reliability factors in combination with its low costs as contrasted to twice the cost for implementation of Alternative 4A. The EPA does not consider subaqueous

mine waste disposal technology to represent the most effective remedy in terms of performance and reliability. The remedy was selected in order to implement a more controlled remedial scale cleanup approach that will hopefully provide data and information that were lacking as a result of the inconclusive pilot study performed at the Waco subsite. The pilot study failed to establish the hydraulic connection and monitoring effectiveness of monitoring wells assessing contamination emanating from the filled pit, failed to determine groundwater flow directions and gradients (both horizontal and vertical), and included a dye trace study that was inconclusive and ultimately not published or placed within the report. Several review comments from the EPA and the KDHE illustrating these points are contained within the Administrative Record. The study did show substantial increases in metals concentrations within the filled pit (greater than ten-fold) that have been decreasing over time; although, the contaminant concentration levels have not decreased to pre-pit filling concentrations and there are no geochemical data that support any type of chemical neutralization (anaerobic condition) is occurring and the hydraulic controls and monitoring points surrounding the filled pit have not been proven to be capable of effectively monitoring any impacts from the filled pit. The EPA provided sampling and analysis results to Newfields (electronic mail on 11/4/03 and 11/20/03) demonstrating the lack of geochemical data substantiating the achievement of reducing, anaerobic conditions based on samples analyzed by the EPA from the Waco pilot study pit. This information has been added to the Administrative Record. In summary, the pilot test has not been conclusive in answering questions on the viability of subaqueous mine waste disposal, and given the fact that this is a new technology with an unproven historic record, the EPA does not consider this approach to represent the best choice in terms of permanence and reliability, but nonetheless, has decided, with KDHE and U.S. Fish and Wildlife Service concurrence, to implement this technology as a remedial demonstration aimed at additional data gathering and process validation. With regard to costs, Alternative 4 is estimated at an approximate cost of 5 million dollars and Alternative 4A is estimated at an approximate cost of 7 million dollars.

- Modifying Criteria Evaluation - The EMS letter indicates that conversations with local land owners (four total identified earlier for the Waco area) indicate that a no action alternative is preferred and that there are concerns over takings issues related to remediation of mining wastes. The EPA has also had conversations with two of the Waco landowners, as well as additional landowners in the Crestline and Badger subsites, and has not been informed by any land owner that a no action alternative is preferred and has also not been informed of any concerns related to mine waste takings issues. Additionally, no documents to this effect were made by landowners at the public meeting or in writing (although the EPA notes that land owners were not required to attend the meeting or make comments). However, speaking to the point of community acceptance, it should be noted that there is no

active removal or sale of mining wastes from any of the remote OU-6 subsites. Moreover, the EPA has had conversations with many residents (several hundred people) of Cherokee County, Kansas, during past environmental work conducted at the site and has experienced wide-spread citizen support for removal and remediation of mining wastes within the county. Mayors and city council members from the communities of Baxter Springs, Treece, and Galena, Kansas have all indicated strong support for environmental cleanups in Cherokee County. Similar support has been provided by the Cherokee County Commissioners (recent decision to terminate the use of chat mining wastes for surface road material), the Cherokee County Health Department, and the Cherokee County Engineer. Additional work beyond the amount performed under all of the historic cleanup decisions has been requested by all municipalities involved in all historic cleanups. Private citizen lawsuits referenced in the toxic tort discussion above also illustrate the wide-spread concern and opinions of citizens within the Tri-State mining district on the topic of mining wastes and environmental impacts.

- Cleanup Funding and Responsible Party Liability Assessment - The EMS letter raises questions and issues related to the Federal Government's ability to fund environmental cleanups and discusses potential future liability assessments for responsible parties. This discussion is not relevant to the proposed selection of the remedy, and is better suited for future Consent Decree discussions for performance of remedial design and remedial action at OU-6.

Figure 1

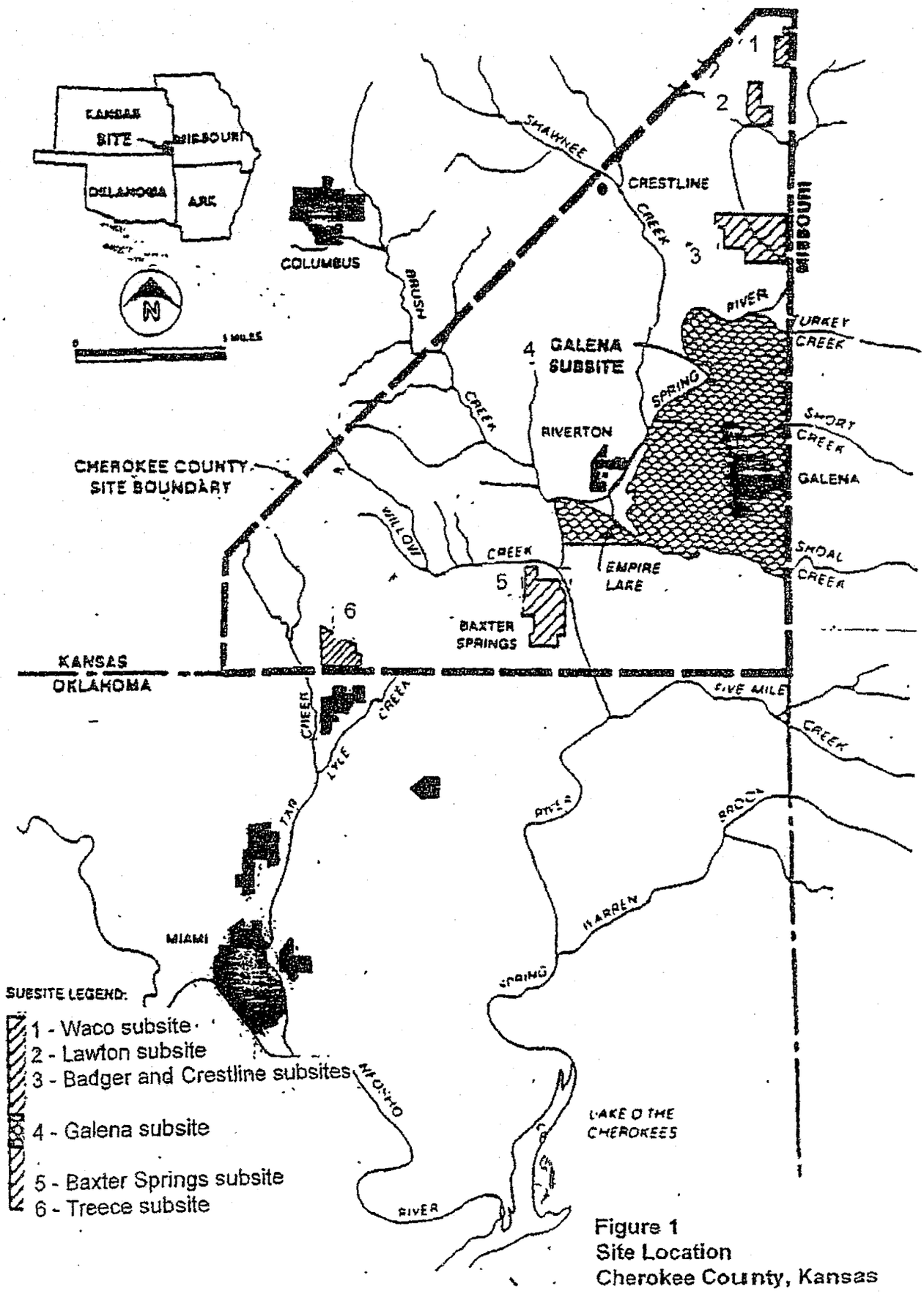
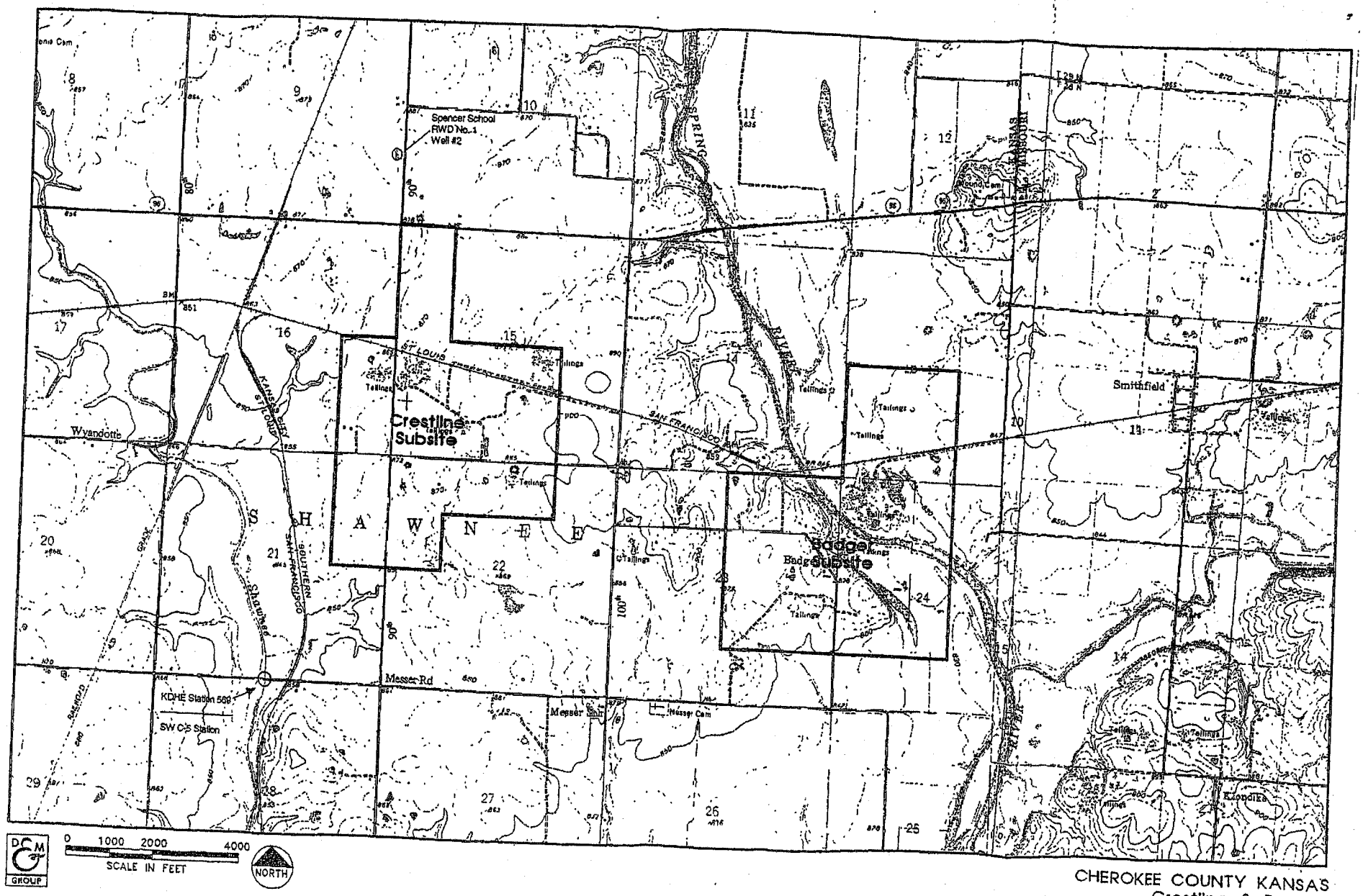
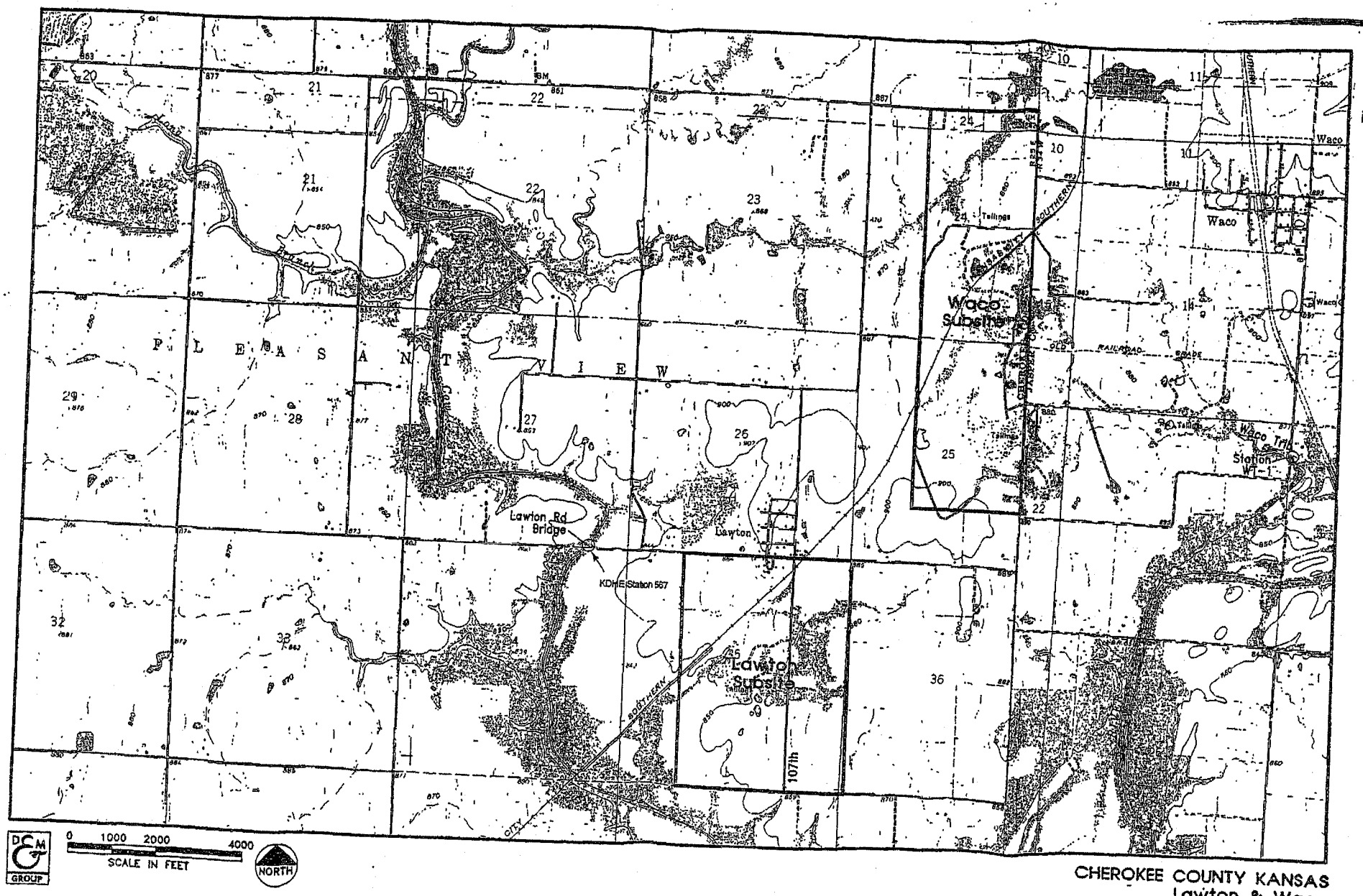


Figure 1
Site Location
Cherokee County, Kansas



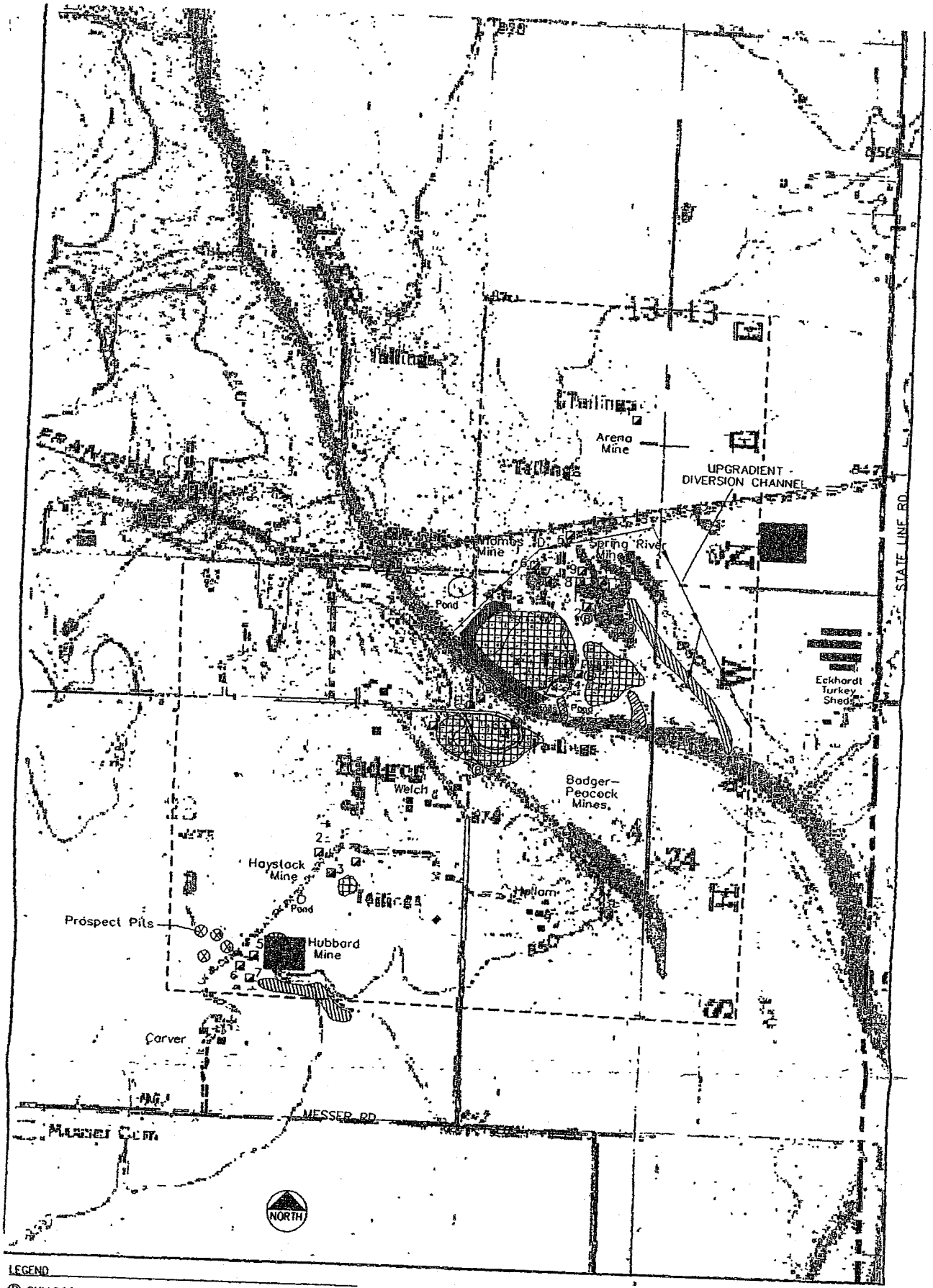
CHEROKEE COUNTY KANSAS
Crestline & Badger
Subsite Location Map
Figure 2

Figure 2



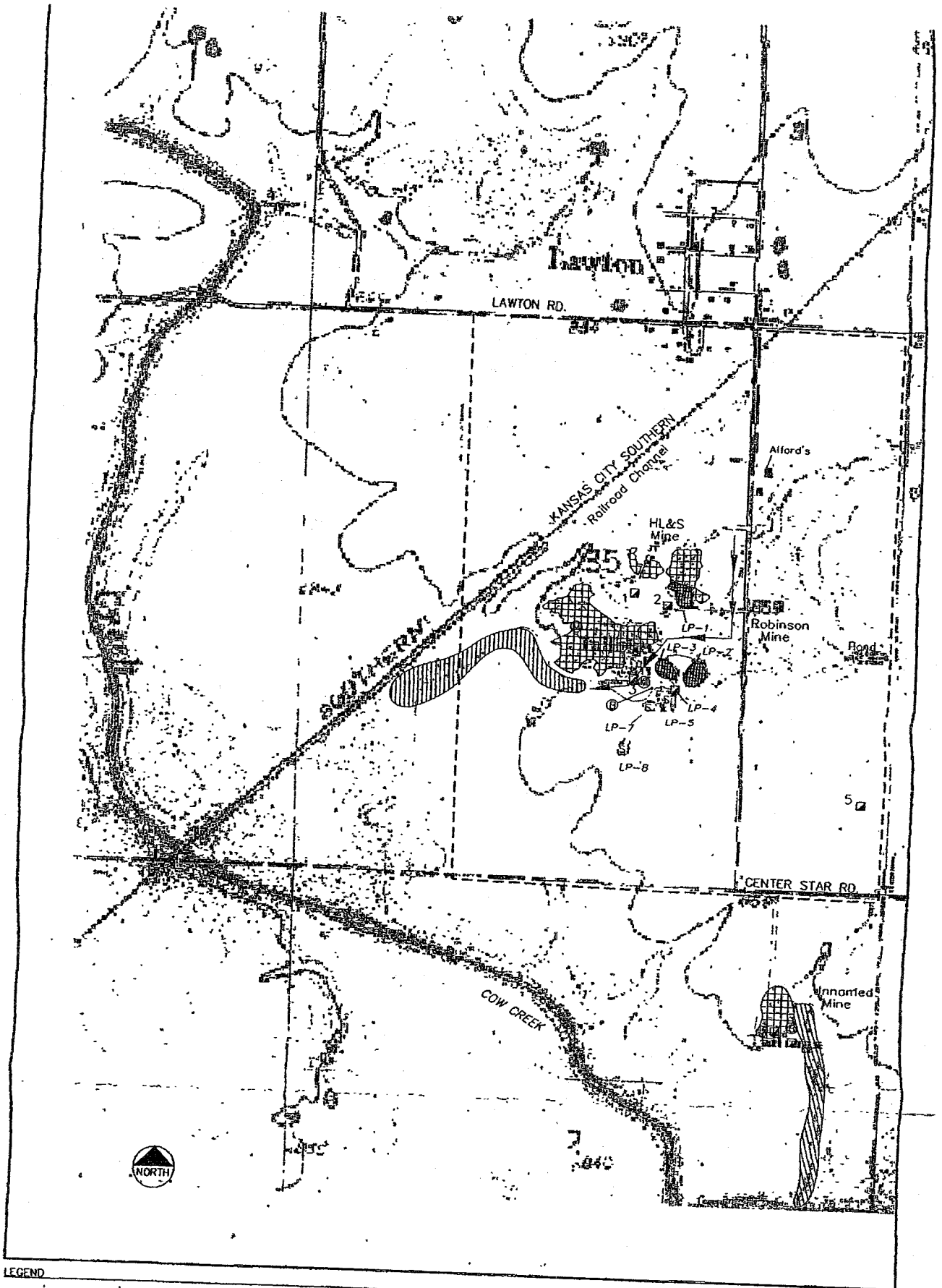
CHEROKEE COUNTY KANSAS
Lawton & Waco
Subsite Location Map
Figure 3

Figure 3



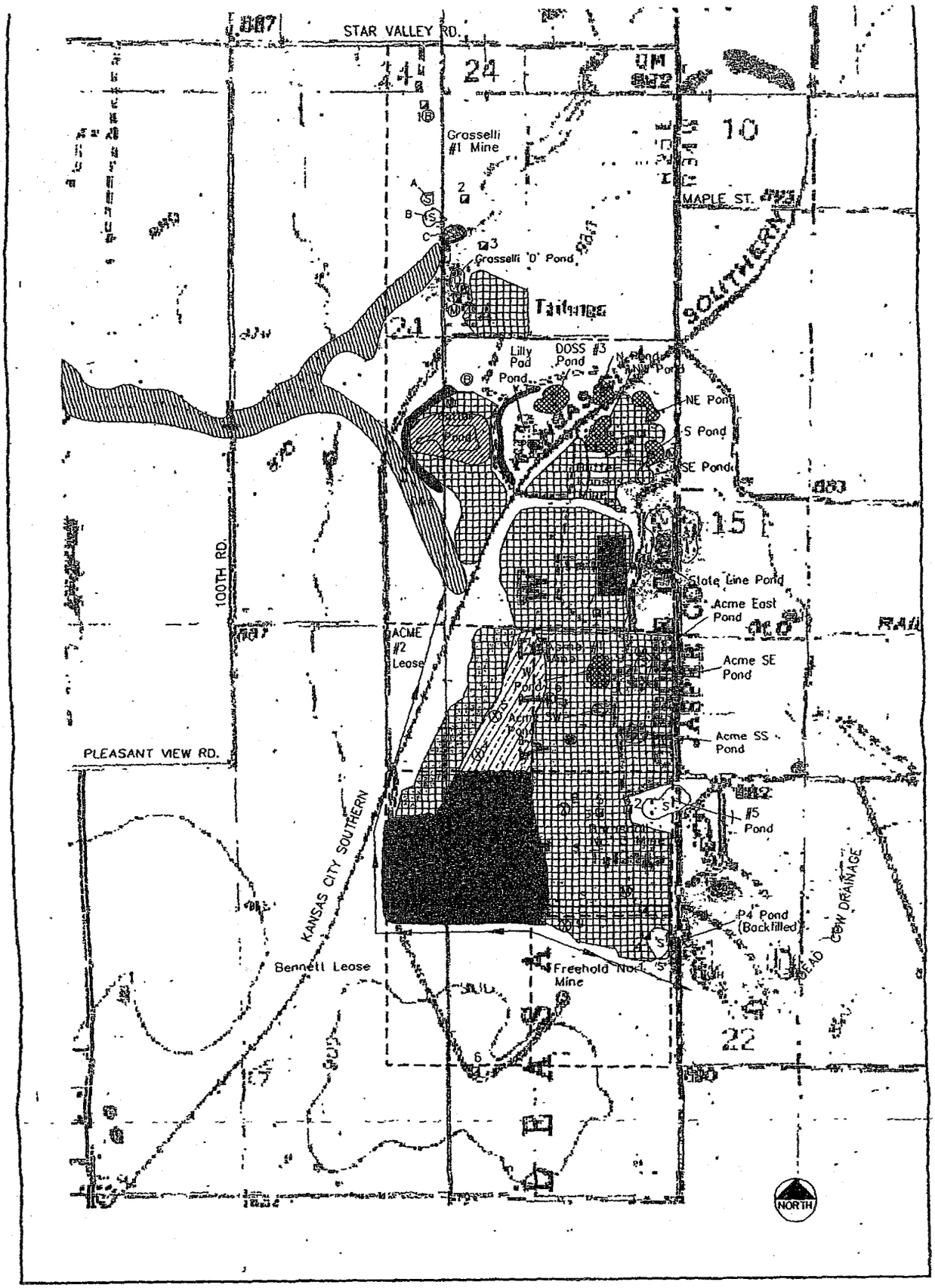
CHEROKEE COUNTY KANSAS
Badger Subsite
Alternatives 4,5,& 6

Figure 4



CHEROKEE COUNTY KANSAS
Lawton Subsite
Alternative 4

Figure 5



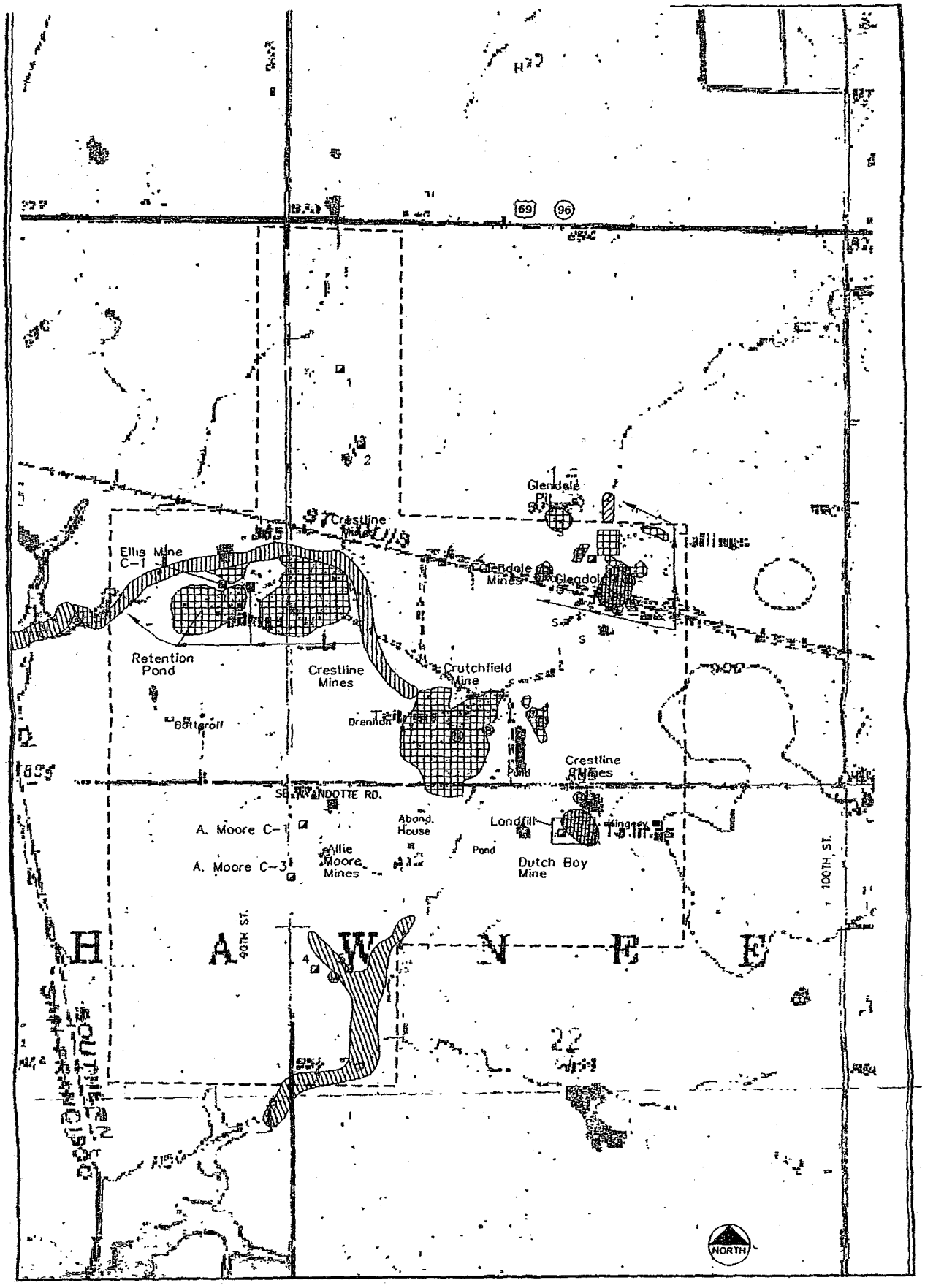
LEGEND

- BULLROCK
- MILL SITE
- SHAFT
- BUILDING
- SUBSIDENCE PIT
- TEST PIT
- MILL WASTE
- DIVERSION CHANNEL
- MILL WASTE CAPPED IN PLACE
- ON-SITE RETENTION POND CLEANED OF WASTE MILL
- FILLED AND CAPPED SUBSIDENCE PIT
- EXCAVATED STREAM CHANNEL
- EXCAVATED MILL WASTE
- EROSION CONTROL SEDIMENT DETENTION BERM
- ON-SITE REPOSITORY (NOT TO SCALE)

CHEROKEE COUNTY KANSAS
Waco Subsite
Alternative 6

0 400 800 1600
SCALE IN FEET

Figure 6



LEGEND

- BULLROCK
- MILL SITE
- SHAFT
- BUILDING
- S SUBSIDENCE PIT
- MILL WASTE
- DIVERSION CHANNEL
- EXCAVATED STREAM CHANNEL
- EXCAVATED MILL WASTE
- FILLED AND CAPPED SUBSIDENCE PIT

0 400 800 1600
SCALE IN FEET

CHEROKEE COUNTY KANSAS
Crestline Subsite
Alternative 4

Figure 7

TABLE 1

REMEDIAL ACTION OBJECTIVES (RAOs)

Soils and Source Materials RAOs

1. Prevent human ingestion of contaminants of concern from on-site soils or source materials that would potentially result in cancer risks greater than 1.0EE-06, non-carcinogenic hazard indexes greater than 1, or blood lead levels causing unacceptable human health risks. Soils or source materials containing less than 800 parts per million (ppm) lead and less than 75 ppm cadmium are deemed acceptable for preventing these potential human health risks.

2. Prevent the exposure of biota to contaminants of concern in materials that would potentially result in excessive ecological risks.

Surface Water and Sediment RAOs

1. Prevent exposure of biota to surface waters exceeding Kansas Aquatic Life Criteria and sediments exceeding MacDonald Threshold Effects Concentration (TEC) values, or background sediment values, resulting from the release and transport of contaminants of concern from mine wastes within the subsites.

2. Prevent risks to biota by controlling the erosion and transport of mine wastes and impacted sediments.

Groundwater RAOs

1. Prevent human ingestion of contaminants of concern in subsite groundwater at concentrations exceeding the National Primary and Secondary Drinking Water Standards.

2. Prevent exceedances of drinking water standards caused by the downward migration of site-related groundwater from the shallow Boone Aquifer to the deep Roubidoux Aquifer.

3. Prevent the discharge of groundwater containing site-related contaminants of concern that would result in exceedances of surface water and sediment criteria or cause excessive ecological risks.

TABLE 2

SUMMARY OF POTENTIAL CLEANUP ALTERNATIVES

No.	Description	Effectiveness	Implementability	Cost
1.	*No Further Action* - Implement institutional controls to reduce soils, source materials, and groundwater risks	Would effectively address potential human health risk because institutional controls are being implemented site-wide. Would not be effective in addressing surface water RAOs or risks.	Readily implementable.	Capital and O&M Costs: less than $500,000.
2.	Water Management and Erosion Controls - Implement institutional controls to reduce soils, source materials, and groundwater risks - Detain on-site runoff in constructed pond - Divert clean runoff away from affected areas - Excavate ephemeral stream sediments - Stabilize eroding waste piles with soils or biosolids and revegetate - Abandon deep wells.	Effective in reducing metal and sediment loadings to surface waters. However, would probably not achieve ARARs in all state-listed ephemeral streams. Periodic ARARs exceedances in classified streams and rivers would still occur due to upstream sources.	Readily implementable.	Capital and O&M Costs: less than $3,000,000.
4.	Source Removal and Subsidence Pit Disposal - Implement institutional controls to reduce soils, source materials, and groundwater risks - Excavate ephemeral stream sediments - Excavate source materials to meet ARARs in state-listed ephemeral streams - Dispose excavated wastes in on-site subsidence pits with soil covers - Revegetate excavated areas - Perform drainage and erosion controls, as prescribed in Alternative 2 - Abandon deep wells.	Effective in reducing metal loadings and possibly meeting ARARs in state-listed ephemeral streams. Placing mill waste in the under-ground workings permanently removes the wastes from the aboveground environment. Periodic ARARs exceedances in classified streams and rivers would still occur due to upstream sources.	Technically implementable. However, EPA and state approval is partially dependent on the results of field demonstrations. Hence, the administrative implementability is somewhat uncertain.	Capital and O&M Costs: $5,000,000.
5.	On-Site Containment and Drainage and Erosion Controls - Implement institutional controls to reduce soils, source materials, and groundwater risks - Excavate ephemeral stream sediments - Consolidate chat and tailings deposits on site sufficient to meet ARARs in listed streams - Revegetate excavated areas - Cap consolidated waste piles with soil cover systems - Perform drainage and erosion controls, as prescribed in Alternative 2 - Abandon deep wells.	Effectiveness is dependent, in part, on cover design and cost. Cover systems can be designed to achieve and maintain ARARs in state-listed ephemeral streams. Periodic ARARs exceedances in classified streams and rivers would still occur due to upstream sources.	Readily implementable. Hydrologic modeling can be used to predict percolation rates for different cover designs.	Capital and O&M Costs: $5,000,000.
6.	Source Removal and Aboveground Disposal - Implement institutional controls to reduce soils, source materials, and groundwater risks - Excavate ephemeral stream sediments - Excavate all mill wastes within the subsites and dispose in engineered repositories, subsidence pits, or revegetate in-place - Revegetate excavated areas - Perform drainage and erosion controls, as prescribed in Alternative 2 - Abandon deep wells.	Despite extensive source removal, this alternative is deemed no more effective than Alternatives 4 or 5. Periodic ARARs exceedances in classified streams and rivers would still occur due to upstream sources.	Implementable, but this alternative would require large soil borrow areas to build the on-site repositories. Adequate cover materials may not be available.	Capital and O&M Costs: more than $10,000,000.

APPENDIX A2

EPA/ROD/R07-04/656
2004

EPA Superfund
Record of Decision:

ORONOGO-DUENWEG MINING BELT
EPA ID: MOD980686281
OU 01
JOPLIN, MO
09/30/2004

RECORD OF DECISION
DECLARATION

SITE NAME AND LOCATION

Oronogo/Duenweg Mining Belt Site, Operable Unit 1
Jasper County, Missouri

STATEMENT OF BASIS AND PURPOSE

The U.S. Environmental Protection Agency (EPA) has prepared this decision document to present the selected remedial action for mining and milling wastes at the Oronogo/Duenweg Mining Belt Site (Site) located in Jasper County, Missouri. This decision was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for this Site. The Administrative Record file is located in the following information repositories:

1. Joplin Public Library
   300 Main
   Joplin, Missouri

2. Webb City Public Library
   101 South Liberty
   Webb City, Missouri

3. Carl Junction City Hall
   105 North Main
   Carl Junction, Missouri

4. U. S. Environmental Protection Agency
   901 North 5th Street
   Kansas City, Kansas

The EPA has coordinated selection of this remedial action with the Missouri Department of Natural Resources (MDNR). The state of Missouri concurs on the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This selected remedy deals with the cleanup of mining and milling wastes, soil, and selected sediments contaminated with metals from past mining activities at the Site. This cleanup action is one part of the EPA's overall efforts under Superfund to deal with environmental contamination resulting from historic lead and zinc mining, milling, and smelting operations in Jasper County. Cleanup activities of metals contaminated residential yards and

individual private water wells have already been implemented, and are nearly complete. This phased approach to the cleanup is being used for this Site in order to clean up the contamination which poses the greatest health threat first. The EPA believes that the selected remedy is consistent with previous cleanups that conducted at the Site.

The major components of the selected remedy are:

- Removal of mine/mill wastes, contaminated soil, and selected stream sediments
- Subaqueous disposal of excavated source material in mine subsidence pits
- Recontouring and revegetating excavated areas
- Plugging of selected mine shafts and surface water diversion from mine openings
- A monitoring program for assessing the effect of cleanup on Site streams
- Continuation of the Health Education Program established under OU 2/3
- Institutional controls to regulate future residential development in contaminated areas and the use of the disposal areas

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, is expected to comply with chemical-, location-, and action-specific federal and state requirements that are legally applicable or relevant and appropriate to the remedial, action, and is cost-effective. This remedy utilizes permanent solutions to the maximum extent practicable. Natural treatment of waste will occur after disposal to reduce the mobility of the metals contamination in the wastes.

Because this remedy will result in hazardous substances remaining on the Site above health-based levels, a review will be conducted within five years to ensure that the remedy continues to provide adequate protection of human health and the environment.

Cecilia Tapia, Director
Superfund Division
U.S. EPA, Region 7

3/30/04
Date

Record of Decision

ORONOGO-DUENWEG MINING BELT SITE
JASPER COUNTY SUPERFUND SITE
JASPER COUNTY, MISSOURI

MINE AND MILL WASTE
OPERABLE UNIT 1

Prepared by:

U.S. Environmental Protection Agency
Region VII
901 North 5th Street
Kansas City, Kansas 66101

September 2004

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List of Figures and Tables

Figures

Tables

1.0 Introduction

This Record of Decision (ROD) has been developed by the United States Environmental Protection Agency (EPA) to address the mine and mill waste in Operable Unit 1(OU-1) of the Oronogo-Duenweg Mining Belt site (also known as the Jasper County Superfund site) located in Jasper County and portions of Newton County, Missouri. This ROD is published in accordance with the requirements of Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also referred to as the Superfund Law), 42 U.S.C. §9617.

The EPA has coordinated the development of this ROD with the Missouri Department of Natural Resources (MDNR). The EPA is the lead agency and the MDNR is the support agency.

2.0 Purpose of the Record of Decision

The primary purpose of the ROD is to document the cleanup alternative selected by the EPA to address the metals contamination from past mining and milling operations at this site. The cleanup alternative presented in this ROD was selected by the EPA after review and assessment of comments received during the public comment period. Documents supporting this decision are included in the Administrative Record (AR). This ROD and supporting documents in the AR are available for review during normal business hours at the following locations:

1. Joplin Public Library
   300 Main
   Joplin, Missouri

2. Webb City Public Library
   101 South Liberty
   Webb City, Missouri

3. Carl Junction City Hall
   105 North Main
   Carl Junction, Missouri

4. U.S. Environmental Protection Agency
   Region VII Docket Room
   901 North 5th Street
   Kansas City, Kansas

3.0 Community Participation

The EPA issued the Proposed Plan for OU-1 on July 19, 2004, and provided a 30-day review and comment period opening on July 19, 2004, and closing on August 19, 2004. A public meeting to present the plan and receive comments was held August 3, 2004, in Matthews Hall at the Missouri Southern State University in Joplin, Missouri, from 7:00 pm to 8:30 pm. Included in this ROD is a responsiveness summary that addresses in writing the significant comments the EPA received from the public during the comment period.

4.0 Site Background Information

The Oronogo-Duenweg Mining Belt site (Site) is located in Jasper County and portions of Newton County, Missouri. The Site is a concern because of mining wastes on the surface which constituted a significant source of heavy metals contamination with potential for exposure to people and environmental receptors. Past mining and milling practices resulted in the contamination of surface soil, sediments, surface water, and groundwater in the shallow aquifer. The primary contaminants of concern are lead, cadmium, and zinc. The EPA listed the Site on the National Priorities List (NPL) in 1990. The NPL is a national list of superfund sites that prioritizes cleanups in order of the most serious contamination problems and greatest threats to human health and the environment. The Site includes the mining wastes in and around 11 former mining areas, or designated areas (DAs), located within about 270 square miles of Jasper and Newton Counties. The DAs include Snap, Neck/Alba, Thorns, Joplin, Oronogo/Duenweg, Carl Junction, Klondike, Iron Gates, Iron Gates Extension, Belleville, and Waco. A map of the DAs is shown on Figure 1.

The Site is part of the Tri-State Mining District, which encompasses approximately 2,500 square-miles in Missouri, Kansas, and Oklahoma. The district's historic lead and zinc production ranks as one of the highest in the world, with total ore production estimated to have been slightly more than 0.5 billion short tons. The Missouri portion of the district accounted for approximately 0.2 billion short tons of the ore production, of which approximately 80 percent was derived from Jasper County. Mining in the Site was conducted from about 1848 to 1968. The majority of the mining was by underground methods where the mined ore was hoisted from the underground workings and was treated at mills on the surface. At the mills, the crude ore was crushed and sized to minus 5/8 inch, and then concentrated using gravity separation processes, or froth-flotation after about 1920.

During the early years of mining, lead concentrates were smelted in a large number of crude log furnaces. Advances in smelter technology and increasing specialization by operators led to centralization, and by 1873 there were only 17 lead smelters in the Joplin area. By 1894, the number had decreased to three, and to one by the 1920s. Most zinc concentrates were shipped to smelters located outside the district in areas where fossil fuel was abundant, as the smelting of zinc required considerably more heat than lead.

Approximately 160 million short tons of crude ore were mined in the DAs of which approximately 5 percent was recovered as zinc/lead concentrates, leaving an estimated 150 million short tons of discarded mill waste on the surface. Approximately 93 percent of this material has since been removed for various commercial purposes. Volume estimates prepared during the 1992 Remedial Investigation (RI) of the mine and mill waste remaining on site are indicated in Table 1.

5.0 Scope and Role of the Cleanup Action

As mentioned in the previous section, the investigation and study of the Site includes the mining wastes in and around 11 former mining areas or DAs located within about 270 square miles of Jasper and Newton Counties. The EPA divided the Site into four Operable Units (OUs) for cleanup activities because of the multi-media nature of contamination. The OUs include OU-1, Mining and Milling Waste; OU-2, Smelter Waste Residential Yards; OU-3, Mine Waste Residential Yards; and OU-4, Groundwater. This ROD addresses OU-1 and includes those areas in and around the DAs where mining, milling, and smelter wastes are located.

A Site-wide investigation was conducted February-September 1993, collecting data primarily on mined materials, soils, surface water, groundwater, terrestrial and aquatic biota, land use and demography, air quality, and human food sources. The results of this sampling program were documented in the Site Characterization Memorandum. The RI, with expanded sections on surface water, groundwater, fate, and transport, was completed in 1995.

In 1993, the EPA commissioned CDM Federal Programs Corporation (CDM) to conduct site investigations and characterization of the Iron Gates, Belleville, and Klondike DAs. This investigation is reported in the Site Characterization Report. In December 1994, CDM was directed to investigate a fourth DA, the Iron Gates Extension. This DA is located north of Shoal Creek in Jasper and Newton Counties (Figure 1-1). The results of this investigation are reported in an Addendum to the Site Characterization Report. CDM's approach, as directed by the EPA, was to be patterned on the previously approved sampling and analysis plan used for the other seven DAs. Their investigative approach for the DAs was documented in a 1993 Sampling and Analysis Plan.

A Feasibility Study (FS) was completed in 2003. The FS combines the information about the nature and extent of contamination in and around the DAs described in the Site Characterization Reports and the investigations characterizing and evaluating the DAs. The FS developed alternatives for remedial action for the entire Site. Additional studies have been conducted by the EPA, the MDNR, and the Potentially Responsible Parties (PRPs) to assist in developing and supporting the alternatives in the FS. The EPA and the PRPs conducted a sub-aqueous disposal pilot study in. which approximately 58,000 cubic yards of tailings were disposed in a mine pit near Waco. This study showed an initial release of metals into the groundwater and within a short time later the metals concentrations became stable. In addition, metals were not significantly leached out of the tailings because they were disposed under water and capped. The MDNR performed a similar study near Webb City by filling a mine shaft with bedrock materials. Results from that study were similar to the Waco study. The EPA and the MDNR have performed several studies to assess the effectiveness of biosolids application on mining wastes in the Oronogo and Carterville areas. These studies have shown that biosolids application is effective at reducing metals toxicity and promoting plant growth. These studies are all included in the AR for the Site.

This ROD for OU-1, Mining and Milling Waste, is consistent with previous EPA decisions for this Site. OU-1 was initially established to address the ecological and human health risks associated with mining, milling, and smelter wastes in the nonresidential areas. Subsequently, other OUs were established to address the human health risks associated with drinking water sources and residential soils. The EPA prioritizes response actions based on the need to address human health risks first.

In July 2000, the EPA issued an Engineering Evaluation/Cost Analysis (EE/CA) to initiate cleanup actions for a portion of OU-1 in the Oronogo-Duenweg DA of the Site. The Missouri Department of Transportation (MDOT) informed the EPA of plans to construct a portion of Highway 249 through mining waste areas in that part of the Site. The EPA coordinated with MDOT on the plans and alignment of the route. Subsequently, the EE/CA was issued and this decision specifies to use approximately 600,000 cubic yards of mining waste for construction of the highway. Portions of the highway are complete and MDOT is awaiting federal and state highway funds to complete the project.

The EPA has already initiated or completed a series of remedial actions to address human health risks at this Site, as follows: OU-4, Groundwater, which provides a public water supply to replace private shallow aquifer drinking water wells; and OU-2/3, Residential Yards, which removed lead and cadmium contamination from about 2,600 residential yards. These OUs include institutional controls (ICs) to protect future residents. For example, OU-4 restricts future access to the shallow contaminated groundwater. The RODs for these OUs are available in the AR repositories for the Site.

The EPA's current priority under this ROD is to address the risks posed by mine and mill wastes. OU-1 is focused primarily on mitigating risks to aquatic and terrestrial life. Secondly, OU-1 contains engineering controls to protect future human health. This ROD addresses risks to future residents through reliable and permanent engineering controls that significantly reduce the need for ICs that have been administratively difficult to implement, but were required under OU-2/3. In addition, this ROD establishes cleanup action levels that protect terrestrial. life and human health from risks of exposure to metals contamination in mine and mill wastes.

The cleanup of mining and milling wastes under this ROD is needed to mitigate the principal threat for OU-1, which is the risks to aquatic and terrestrial ecosystems from exposures to mill wastes, soils, sediments, surface water and groundwater. The main component is to excavate and dispose of source materials in selected on-site mine subsidence pits that are suitable from an engineering perspective for subaqueous disposal. This same remedial component, excavation/disposal, is essential to provide long-term protection of human health from exposure to the mine and mill wastes. The selected remedy for OU-1 will significantly enhance the effectiveness of earlier OU remedies which relied on ICs to protect future residential development in mine and mill waste areas.

6.0 Site Characteristics

The Site is located in and around Joplin in southwest Missouri. Approximately 90,000 people live in the area. The climate is continental with moderate winters and long, hot summers. The annual precipitation is about 40 inches. All watersheds of the Site are within the Spring River drainage basin, a 2,600 square-mile basin in southwest Missouri, southeast Kansas, and northeast Oklahoma. The principal tributaries of the Spring River in the Site are the North Fork of the Spring River, Center Creek, Turkey Creek, Short Creek, and Shoal Creek which are typical Ozark streams where base flows are sustained by springs from limestone in the headwater areas.

Water quality in the Spring River and its tributaries is influenced by runoff and seepage from mill waste, sediment migration from mining source areas into the streams, runoff from agricultural and urban areas, and wastewater discharge. Surface water chemistry is influenced by groundwater from non-point and point sources, mine shafts, and mine subsidence pits. Water quality in the Spring River and its tributaries is regulated by the state of Missouri for various beneficial uses: 1) livestock watering, 2) irrigation, 3) protection of aquatic life, 4) drinking water supply, 5) whole body contact, 6) boating, and 7) industrial water supply.

All of the streams at the Site are impacted from the former mining activity, and exceed federal water quality criteria in many reaches. Site streams and tributaries drain into the Spring River. The Spring River flows southwest into Kansas and continues south into Oklahoma. Metal concentrations exceed Federal aquatic life criteria (ALCs) as they cross the state line into Kansas. Additionally, sediments in the streams down stream of mining impacted areas contain elevated metal concentrations.

Two major aquifers underlie the Site, the Mississippian age Springfield Plateau aquifer and the deeper Ozark aquifer. The two aquifers consist of fractured and karst limestone (upper aquifer) and dolomites (lower aquifer), with the addition of the Gunter Member sandstone in the deep aquifer, and are separated by a sequence of shale and limestone that yields little or no water to wells. This sequence of shale and limestone acts as an impermeable confining layer or semi-confining layer between the two aquifers. The shallow aquifer generally exhibits unconfined or water-table conditions except where Pennsylvanian age shale is present above the limestone. The shallow aquifer hosts the lead-zinc ores. Many private wells tap the shallow aquifer for drinking water and are contaminated with cadmium, lead, and zinc. While most public water supplies are drawn from the deep aquifer, and the city of Joplin uses Shoal Creek for a portion of its water supply.

Two types of wastes were generated during the past milling activities; coarser grained chat and fine-grained tailings. Chat and tailings from the Site contain various levels of lead, cadmium, and zinc, depending on the DA. Chat is a waste product from a tabling and jigging gravity separation process. Chat is composed of gravel-, sand-, and silt-sized siliceous chert and limestone fragments. It is relatively free draining with low moisture content between 3 to 6 percent at depth and lower near the surface, as would be expected from coarse-grained crushed rock. Approximately 5,000,000 cubic yards of chat are located in the Site.

Chat in Jasper County is, and has been, an important source of aggregate and is quarried from the piles as an unprocessed, pit-run material; or in some cases, it is washed and screened for sale as a specifically sized aggregate. Most chat is currently used as aggregate in asphalt and in various types of bituminous overlays, slurry seals, and seal coats for roads. Large volumes have been used in the construction of roads and highways, as the primary aggregate or as the base-coarse material. Some chat is used in the construction of parking lots and driveways in residential settings. The EPA discourages this particular use because of the possible human exposure to heavy metals contained in chat in residential or high-child use settings. Because of its extensive use in all types of road construction, the primary consumers of chat are county and state departments of transportation. The EPA has issued a widely circulated Fact Sheet, dated July 1995 and updated in February 2003, on the use and misuses of mine waste. This fact sheet states that use of chat in unconfined situations presents a risk of exposure to both people and the environment.

Three different types of fine-grained tailings, referred to collectively as tailings, were identified from review of mill and chat processing operations: 1) fines from the gravity separation process, 2) fines from the use of the froth flotation beneficiation process (after about 1920), and 3) fines produced from the washing and screening of chat for use as an aggregate. Tailings are typically 30-60 percent silt-sized, the remainder being fine to medium-sized sand. Due to finer grain size, tailings hold more moisture (20 to 30 percent) than chat. Metal content varies by DA, primarily due to the type of tailings that are present. However, metals concentrations in tailings are in general significantly higher than in chat. It is estimated that there are 363,791 cubic yards of tailings in the Site. Unlike chat, tailings are not generally used as aggregate; thus the volumes, estimated in 1995, are believed to be relatively accurate. However, the estimated volume may be low as some tailings are covered by chat, and these deposits are only discovered when the chat is removed. No tailings were identified in the Klondike, Belleville, Iron Gates, or Iron Gates Extension DAs.

7.0 Current and Potential Future Site Use

Land use in Jasper County is dominated by agriculture, with about 45 percent of the total acreage in row crops or grass pasture. Residential, urban, and commercial/industrial areas combined cover about 30 percent of the DA acreage. Uncultivated land is present along the creeks and river channels that frequently flood, along active and inactive railroad right-of-ways, and in mined areas. Deciduous woodlands generally dominate the uncultivated land.

The area around Joplin and the surrounding communities has, for the past several years, been experiencing tremendous growth and expansion. Vacant uncontaminated land, particularly in the Webb City area, is beginning to become scarce. The EPA has worked with four separate developers to ensure adequate steps are taken prior to residential construction to protect human health. The local county officials are reluctant to establish ICs to control development in this rural community. During 2004 alone, the EPA oversaw remedial actions by developers of eight multi-unit apartment buildings and about 100 single family homes on mine and mill waste contaminated lands. As uncontaminated properties become more and more scarce, development of mine and mill waste contaminated lands will increase.

The local leaders have developed a master plan for some portions of the county and the EPA addresses these planning efforts in this ROD. The "Jasper County, Missouri Route 249 Redevelopment Plan" anticipates controlled development in the corridor of the new Highway 249 presently under construction. This ROD adopts the master plan as an IC which addresses future human health risks by limiting residential developments to areas outside the highway corridor.

8.0 Summary of Site Risks

In general, the EPA has determined that the principal threat for OU-1 is the ecological risk to aquatic biota caused by surface water containing the contaminants of concern (COCs) in concentrations exceeding ALCs and potential risks to terrestrial vermivores that may be caused by ingesting metals from soils exceeding threshold criteria. Additionally, as stated in the previous section, developers continue to construct residential housing on contaminated land which, if not conducted properly by removing or covering contaminated soil, will result in unacceptable risk to people moving into these areas.

The purpose of this ROD, therefore, is to document the EPA's selected remedial actions to mitigate the unacceptable human and ecological risks. The objective is to achieve significant reductions in COC loadings to surface waters, reduce risks to terrestrial vermivores. Moreover, the objective is to rely on the engineering control components of this ROD to permanently protect future residents from the human health risks of exposure to mining and milling wastes. The actions presented in this ROD will help eliminate the need for ICs that have been required, but have been difficult for the EPA to establish and implement. The EPA has determined, as lead agency, that the selected remedy in this ROD is necessary to protect public health or welfare and the environment from actual or threatened releases of hazardous substances into the environment.

8.1 Human Health Risk Assessment

The EPA prepared a baseline risk assessment for human health in 1995. The risk assessment addresses exposure and metals toxicity, and summarizes both quantitative and qualitative risk. Estimated metal intakes were compared to toxicity values in order to characterize non-carcinogenic effects. For estimating carcinogenic effects, estimated intakes and chemical-specific dose-response data were used to calculate the probabilities of an individual developing cancer over a lifetime. Exposures to lead were assessed separately, through the use of the Integrated Exposure Uptake Biokinetic Model (IEUBK). The risk assessment identified potential health risks for children who live on and near mill wastes, particularly those who also consume backyard garden produce. Exposure to cadmium and lead in soils, mill wastes, and garden produce accounted for most of the numeric calculated health risk. The assessment showed an unacceptable risk for people living on. soils or mine waste with lead levels exceeding 800 ppm lead or 75 ppm cadmium. Remedial actions taken under OU-2/3 have addressed the current risk.

The risk assessment identified a future risk for people building new homes on mining waste areas where surface soil or the mining wastes that contain COCs that exceed the action levels. The ROD for OU-2/3 includes ICs to reduce the future risk, and specify that the local government should establish an environmental health ordinance to control residential development on undeveloped lands with mining and milling waste. The EPA has worked with the local government and encouraged development of such ordinances; however, no ordinances have been established. Since the RODs were issued in 1998, many residential developments have been built at the Site without protective ICs. The EPA has provided assistance to developers and oversight of construction in some developments to reduce human health risks. This ROD provides cleanup levels for contaminated soil and mine and mill waste to reduce the reliance on ICs.

8.2 Ecological Risk Assessment

The Baseline Ecological Risk Assessment (BERA) evaluated risk to aquatic and terrestrial systems in the Site. The BERA addresses risks to aquatic vegetation, aquatic invertebrates, and fish by comparing the maximum measured concentrations of cadmium, lead, and zinc to water quality criteria and standards and conservative toxicity criteria. As evaluated in the BERA, maximum dissolved COC concentrations in surface water exceed Missouri's Aquatic Life Criteria (ALCs) and the Federal Ambient Water Quality Criteria (WQC), and the maximum concentration of COCs in some stream and pond sediments exceed low and severe effect sediment toxicity criteria. Maximum dissolved COC concentrations in some streams and ponds exceed aquatic vegetation toxicity values.

Risks to soil function were addressed in the BERA by comparing soil COC concentrations to toxicity benchmarks from the literature for plants, earthworms, and soil microflora. Comparisons to phytotoxicity reference values indicate that most mine-impacted soils contain COCs at concentrations that could be expected to adversely affect plant growth.

Comparisons to conservative earthworm toxicity benchmarks in the BERA indicated that both mining-related and non-mining related soils contain COCs at concentrations that could be expected to adversely affect earthworm populations. A site-specific study compared soil and earthworm body-burden COC concentrations to a range of sub-lethal and lethal toxicity values. Some soil COC concentrations exceeded the toxicity benchmarks.

The BERA evaluated risk to terrestrial receptors by modeling exposures to specific feeding guilds within the terrestrial environment. Risks to terrestrial vertebrate populations and communities were evaluated by comparing the average daily dose to selected toxicity reference values. An addendum to the final BERA reevaluated risks to terrestrial vermivores and concluded that terrestrial vertebrates that consume earthworms in soils with elevated COC concentrations may experience adverse chronic effects.

A technical memorandum "Risk Management Considerations for Terrestrial Vermivores" identified risk management strategies and described how risk-based cadmium, lead, and zinc threshold criteria were developed. These criteria establish a level of protectiveness that will mitigate risks to terrestrial vertebrates as follows: lead at 804 ppm, cadmium at 41 ppm, and zinc at 6,424 ppm. In summary, the BERA and addendum, other studies, and technical memorandum indicate that ecological risk management at the Jasper County Site is driven by 1) exposure of aquatic biota to surface waters that contain cadmium, lead, and/or zinc concentrations that exceed ALCs and 2) exposure of terrestrial vermivores to earthworms in soils that exceed risk-based threshold criteria established for the Site. The actions evaluated in the FS do not address risk to terrestrial invertebrate populations or plants.

9.0 Remedial Action Objectives

The media-specific remedial action objectives (RAOs), developed in the FS to address the Site risks, are discussed in the following Sections:

9.1 Source Material RAO

The source material RAO has been designed to address the potential ecological risks associated with direct exposure to COCs in mine and mill wastes, and in the affected soils surrounding the wastes. Terrestrial vertebrates, specifically vermivores whose diet consists of earthworms and other soil-dwelling invertebrates, are identified as the receptors of concern based on information from the BERA. Ecological risks associated with source material erosion (as sediment) and seepage/runoff are addressed in other RAOs.

Exposure routes consist of ingestion of earthworms and other invertebrates in source materials and affected media with greater than 41 mg/kg cadmium, 804 mg/kg lead, or 6,424 mg/kg zinc that provide suitable habitat for site vermivores. Based on this exposure scenario, the source material RAO is as follows:

- Mitigate risks to terrestrial vermivores from exposure to COCs from mine, mill, and smelter wastes within the Site, such that the calculated toxicity quotients or hazard indexes are less than or equal to 1.0.

9.2 Sediment RAO

Sediments of concern in the Site consist of source materials that are eroded from source areas to waters bodies; Class P streams (as defined under Missouri's water quality standards program), and their tributaries. Sediments represent a unique category of source materials that have been transported, or may be transported in the future, to aquatic environments where they potentially affect water quality and streambed substrate, thereby posing risks to aquatic biota. The exposure pathway of concern for the sediment RAO is the movement and

redistribution of source materials that could result in exposure of aquatic biota to elevated COC concentrations. The COCs for sediments are cadmium, lead, and zinc. The sediment RAO for OU-1 is as follows:

- Mitigate risks to aquatic biota in Class P streams and their tributaries exceeding Federal ALCs for the COCs by controlling the transport of mine, mill, and smelter wastes from source areas to waters of the state.

9.3 Surface Water RAOs

Two RAOs have been developed that address two different pathways of exposure to aquatic biota. The first exposure pathway of concern is the transport of COCs to Class P streams and their tributaries resulting from seepage and runoff (dissolved and particulate metals) from source materials. The second exposure pathway involves the transport of COCs to Class P streams and their tributaries resulting from mine pit and pond discharges. The criteria for Class P streams and their tributaries are the Federal ALCs, as calculated based on the hardness observed in the individual surface water bodies. The RAOs for OU-1 surface water are as follows:

- Mitigate exposure of aquatic biota to COCs released and transported from mine and mill wastes where surface water applicable or relevant and appropriate requirements (ARARs) are exceeded in Class P streams and in tributaries.

- Mitigate exposure of aquatic biota to COCs released and transported from Site mine-related pits and ponds where surface water ARARs are exceeded in Class P streams and in tributaries.

9.4 Groundwater RAO

The groundwater RAO addresses exposure of aquatic biota to COCs in Class P streams that receive discharge from flowing mine openings (e.g., mine shafts, vents, subsidence pits, etc.). The contaminant criteria are Federal ALCs. The COCs for OU-1 groundwater are cadmium, lead, and zinc. The RAO for OU-1 groundwater is as follows:

- Mitigate exposure of aquatic biota to COCs in releases of groundwater from flowing mine shafts of the Site where surface water ARARs are exceeded in Class P streams and in tributaries.

The groundwater RAO for this OU is limited to protecting the surface water from groundwater impacts due to flowing mine shafts. The RAO of mitigating human health risks from exposure to the contaminated shallow aquifer was addressed in OU-4, Groundwater, which provides an alternate public water supply to residents and establishes

ICs to mitigate the future risks of drilling new drinking water wells in the shallow aquifer. The Missouri Well Drillers law and regulations control shallow and deep aquifer well drilling in the Jasper and Newton County areas to reduce the risk that residents might use the contaminated shallow aquifer. The ROD for OU-4 determined that it is technically impractical for the Agency to remediate the shallow aquifer to achieve compliance with chemical-specific ARARs for drinking water sources. The EPA determined that it is not technically feasible from an engineering perspective to remediate groundwater because of the wide spread nature of contamination throughout the shallow aquifer, karst conditions, and interconnectedness of the mine workings within the shallow aquifer. Although contaminated groundwater seeps into surface waters and contributes some contaminants of concern, the groundwater RAO for this OU addresses only specific groundwater source where remediation is technically feasible, such as the flowing mine shafts, because of the technical impracticability of cleaning up the entire shallow aquifer to meet maximum contaminant levels for drinking water.

10.0 Development of Cleanup Levels

Cleanup criteria to protect terrestrial organisms were developed during the Remedial Investigation/Feasibility Study process as documented in the technical memorandum "Risk Management Considerations for Terrestrial Vermivores". Based on the findings in that document, the EPA is selecting cleanup criteria to protect the terrestrial environment of 800 ppm lead, 40 ppm cadmium, and 6,400 ppm zinc.

The ROD for OU 2/3 established action levels for protection of human health at 800 ppm lead, and 75 ppm cadmium (25 ppm cadmium. in existing gardens). No zinc level was established because zinc in soil has not been determined to cause a risk to people. The action levels were based on discrete samples collected in individual residential yards, where the highest recorded discrete sample was used to trigger a cleanup action for the yard. Once an action was triggered in a yard, all soil exceeding 500 ppm lead was removed to a maximum depth of 12 inches. Analyses performed by the EPA of the more than 50,000 samples collected during the OU 2/3 action indicates that the single highest sample for a yard of 800 ppm lead, generally translated to a yard average lead concentration of 400 ppm. OU 2/3 actions, as stated, were triggered based on single highest sample results. Subsequently, the EPA has released new guidance stating that residential cleanup actions should be based on yard average concentrations. Using the yard average method of determining cleanup action generally results in lower action levels than using the single highest value, or "hot spot" method to achieve equal protectiveness. Additionally, the EPA guidance established 400 ppm lead as a screening level for site, below which cleanup actions are generally not warranted. The 400 ppm lead value established in the EPA guidance is considered to be protective of young children. Therefore, the EPA has determined that protection of human health at this Site requires the cleanup of source materials at action levels of, at least, 400 ppm lead and 75 ppm cadmium.

Obviously, the human health and terrestrial criteria differ with respect to cleanup levels. Therefore, the selected remedy uses the most conservative value between the two sets of criteria as the overall action levels for the Site to protect both future human health and the terrestrial environment. The action levels for source materials and contaminated soils will be 400 ppm lead, 40 ppm cadmium, and 6,400 ppm zinc.

Numeric action levels for source material for protection of the aquatic environment are not being established in this ROD. Aquatic sediment criteria are generally much lower than the concentrations found in the Site source materials. Any source material eroding into streams is considered to create unacceptable risk to aquatic organisms. Therefore, action criteria for source material to protect the aquatic environment are strictly visual, in that any source material eroding, or with high potential to erode to streams and their tributaries will be removed and disposed.

11.0 Summary of Alternative Cleanup Plans Evaluated

The EPA developed and evaluated six alternatives during the FS. The no action alternative also was evaluated, however, the EPA believes that the no action alternative is not protective of ecological health and does not consider it a viable option. The no action alternative and the five action alternatives are described below. Additionally, each of the alternatives will require, to varying degrees, ICs to protect and augment the remedy. The types of ICs that may be included with the remedies are described at the end of this section.

11.1 Remedial Alternatives

The following six remedial alternatives were developed in the FS

Alternative 1: No Further Action – This alternative prescribes no new remedial actions but recognizes and takes into consideration the engineering actions, rules, regulations, ICs, and cultural and land use practices that are currently ongoing or are planned to be performed or implemented, such as the removal and remediation actions and ICs being implemented under OU-2/3, OU-4, the Highway 249 project conducted by the MDOT, and ongoing chat recycling. Cost of this alternative is estimated at $291,000 for continuation of the ICs for 30 years. Waste reduction or containment would be zero.

Alternative 2: Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling – This alternative is a comprehensive alternative that pairs early response actions with long-term containment and on-going recycling. The initial response actions would remove source materials from the floodplains and tributary channels and consolidate these materials in on-site 'waste containment cells. Long-term actions include the use of biosolids to treat, revegetate, and stabilize the consolidated mill wastes, as well as the unconsolidated upland mill waste deposits that remain on site. These long-term treatment and containment actions are designed to reduce metal loadings to surface water, sediment transport, and risks to terrestrial vermivores. This alternative recognizes chat recycling as an ongoing

cultural practice and, by establishing ICs, addresses the inadequacies of current uncontrolled recycling to eventually diminish the amount of untreated and un-contained mill wastes that are subject to runoff and erosion and addresses all chat after 30 years. ICs are designed to regulate chat recycling, end uses for recycled chat, and post-recycling land remediation. Cost of this alternative is estimated at $44,312,000 for remedial action and continuation of the ICs with annual operation and maintenance (O&M) of $101,000. Waste reduction or containment would be 84 percent.

Alternative 3: Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling – The initial response actions are essentially the same under this alternative as under Alternative 2. However, instead of using biosolids applications, this alternative reduces the timeframe to 12 years for remedial actions by using simple vegetated soil covers to contain the consolidated mill wastes, as well as unconsolidated upland mill waste deposits remaining on site. Under this alternative, chat recycling is recognized as an ongoing practice that reduces the volume of mill wastes subject to runoff and erosion and addresses all chat after remediation of other source materials. ICs for chat recycling are the same as Alternative 2. Cost of this alternative is estimated at $77,112,000 for remedial action and continuation of the ICs with annual O&M of $83,600. Waste reduction or containment would be 80 percent.

Alternative 4: Source Removal and Disposal in On-Site Subsidence Pits – This alternative emphasizes the excavation and disposal of source materials in selected on-site subsidence pits that provide a suitable environment for subaqueous mill waste disposal. This alternative prescribes the excavation and disposal of more source materials than either Alternatives 2 or 3, and retains limited opportunities for ongoing chat recycling with the same ICs. The time-frame needed to excavate and dispose of source materials in subsidence pits is estimated at five years. Cost of this alternative is estimated at $58,543,000 for remedial action and continuation of the ICs with annual O&M of $22,500. Waste reduction or containment would be 90 percent.

Alternative 5a: Source Removal and On-Site Disposal in Aboveground Repositories – Alternative 5a prescribes the same degree of excavation and disposal as Alternative 4. However, instead of disposing of the mill wastes in on-site subsidence pits, the wastes are consolidated and disposed in aboveground repositories with geo-composite soil covers designed to nearly eliminate infiltration and seepage. As under Alternative 4, opportunities for ongoing chat recycling are included. Cost of this alternative is estimated at $93,707,000 for remedial action and continuation of the ICs with annual O&M of $137,000. Waste reduction or containment would be 90 percent.

Alternative 5b: Source Removal and On-Site Disposal in Centralized, Aboveground Repositories and Limited Water Treatment – This alternative is called Alternative 5b because it shares similarities with Alternative 5a in terms of its reliance on excavation and disposal of mill wastes in on-site aboveground repositories. However, this alternative is more aggressive in

the amount of mill wastes that are disposed and in the degree of consolidation through the use of centralized repositories. In addition, Alternative 5b couples on-site disposal with passive anaerobic treatment systems to treat the discharges from selected mine openings. Cost of this alternative is estimated at $81,296,000 for remedial action and continuation of the ICs with annual O&M of $102,000. Waste reduction or containment would be 100 percent.

11.2 Source Material Institutional Controls

This section provides information on ICs that were developed to augment the alternative cleanup plans evaluated in the FS. Selected ICs are included in this ROD to enhance and protect the engineering controls in the selected alternative (described in Section 13). ICs are defined as non-engineered access or land use restrictions designed to reduce or prevent residual human health or ecological risks that may remain following the implementation of engineered remedial actions at CERCLA sites. ICs may be useful for controlling human and environmental exposures and improving long-term protectiveness of engineering controls.

The active cleanup plans, Alternatives 2, 3, 4, 5a and 5b, evaluated in the FS include an IC to reduce the exposure risks to human health and the environment from chat recycling activities. The IC considered was to enter into legal agreements with individual owners/operators of chat recycling operations. This IC was developed to regulate chat recycling, end uses for recycled chat, and post-recycling land remediation, and is described in detail in the FS under Alternative 2.

Two general types of ICs were considered in the FS and are proposed to supplement the engineering components of the preferred alternative. In general, the ICs proposed for the preferred alternative should be adopted by a governing body and can be subject to amendment in the future. However, some of the proposed ICs can be established by land use controls under state property laws. The two types of ICs proposed to control source materials that would be disposed or capped on site under the preferred alternative are land use restrictions and access control, and land use regulations and health codes to protect human health.

12.0 Summary of the Comparative Analysis of Alternatives

The National Contingency Plan (NCP), 40 CFR Section 300, requires the EPA to evaluate remedial alternatives against nine criteria to determine which alternative is preferred. The EPA performs this analysis during the FS. The detailed analysis in the FS Report provides an in-depth analysis of the six alternatives compared against the nine criteria. An alternative must satisfy all nine criteria before it can be selected. The first step is to meet the threshold criteria, which are overall protection of public health and the environment and compliance with ARARs. In general, alternatives that do not satisfy these two criteria are rejected.

The second step is to compare the alternatives against a set of balancing criteria. The NCP establishes five balancing criteria which include long-term effectiveness and permanence; reduction in toxicity, mobility, or volume achieved through treatment; implementability; short-term effectiveness; and cost. The third and final step is to evaluate the alternatives on the basis of modifying criteria, which are state and community acceptance.

12.1 Threshold Criteria

The following presents a brief description of how the alternatives satisfy the threshold criteria of overall protection of public health and the environment and compliance with ARARs.

12.1.1 Overall Protection of Human Health and the Environment

This criterion provides an overall assessment of whether an alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors from other criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. A comparative analysis of the remedial alternatives with respect to the overall protection of human health and the environment is given in Table 2.

Alternatives 2, 3, 4, 5a, and 5b will protect the environment to varying degrees. Because of the continued risks to aquatic and terrestrial biota, Alternative 1 (No Further Action) is not considered protective of the environment. None of the RAOs identified for OU-I are consistently met under this alternative. Some or all of the residual wastes will exceed the threshold criteria for vermivores and continue to pose wildlife exposure issues for an indefinite time period.

Alternative 2 provides protection of the aquatic environment through early response actions coupled with interim and long-term actions, such as long-term recycling, designed to address the surface water and sediment RAOs. The surface water RAOs may not be met in all Class P streams all the time because the long-term surface water actions prescribed under Alternative 2 may not be completely effective or reliable in meeting ALCs under all flow conditions. Alternative 2 may not be fully protective of aquatic life in the unclassified tributaries in the near future because the federal chronic ALCs would continue to be exceeded under most flow conditions and the surface water RAOs would fail to be achieved. However, Alternative 2 would likely achieve protectiveness in the tributaries over a very long time frame, i.e., centuries. Although the main actions addressing surface water would occur within the first few years, the time frame for full implementation of the surface water actions is very long, on the order of 30 years. The time estimated to complete Alternative 2 is based on estimated availability of

biosolids from known sources of wastewater treatment plant sludges. If sources of supplies for biosolids included additional wastewater treatment plants, composted poultry or other animal waste, the time frame could be significantly shortened.

Alternative 2 addresses the source material RAO primarily by deep tilling vegetated chat and transition zone soils to reduce metals concentrations below the threshold criteria for vermivores, and might provide a treatment effect to reduce toxicity of the residual metals. With regard to vegetated chat and transition soils, risks to terrestrial vermivores, such as the short-tailed shrew and American Woodcock are low. However, Alternative 2 also relies heavily on ICs, for at least 30 years, to control chat recycling, which offers significantly less permanent and less effective overall protection of human health and the environment compared to the active engineering controls in Alternative 4, which may permanently contain source materials. Although the ICs described in the 1998 Selected Remedy for OU-2/3 provide limited protection for residential development, these controls are not effective unless the local government enacts land use controls, which has not occurred. Thus, Alternatives 2 and 3 rely on IC components to reduce risk from recycling chat and are not as protective as Alternatives 4, 5(a) and 5(b), that use engineering controls to contain source materials.

The groundwater RAO is addressed under Alternative 2 by engineering actions designed to reduce the amount of surface water captured by open mine shafts. These actions include plugging selected mine shafts and diverting surface flows away from open shafts, collapsed shafts, subsidence pits, and other features that connect the surface water regimes to the shallow aquifer.

Alternative 3 relies on early response actions with long-term containment and on-going recycling. It would be protective of aquatic resources by addressing the principal surface water threats in the Site through the initial source consolidation actions aimed at addressing surface water and sediment RAOs. However, like Alternative 2, Alternative 3 may not be fully protective of aquatic life in the tributaries in the near term because the federal chronic ALCs would continue to be exceeded under some flow conditions and the surface water RAOs would fail to be met. Alternative 3 would likely achieve protectiveness in the tributaries over a very long time frame, i.e., centuries. The use of simple soil covers would allow an aggressive schedule for addressing the RAOs (12 years). The source materials RAOs are addressed under Alternative 3 by consolidating and capping tailings, barren chat, in- and near-stream vegetated chat, and vegetated chat sediment sources with simple soil covers. In addition, upland vegetated chat and transition zone soils are deep tilled to reduce metal concentrations below threshold criteria for terrestrial vermivores. These engineering actions are expected to achieve the source material RAOs at full implementation.

In Alternative 3 the groundwater RAO is addressed by engineering actions designed to reduce the amount of surface water captured by open mine shafts, such as plugging certain selected mine shafts and diverting surface flows away from open shafts and subsidence pits.

These actions are deemed adequate for addressing the groundwater RAO by further reducing metal loads to surface waters, although groundwater discharge to surface water does not drive ALC exceedances under current conditions.

Alternative 4 would be protective of human health and the environment by nearly eliminating the transport and exposure pathways associated with surficial mill waste deposits. Alternative 4 is expected to be capable of achieving the metal loading reductions needed to meet the surface water RAOs in the Class P streams soon after completion of the remedial actions and in the tributaries in a relatively short time frame thereafter, i.e., decades. Therefore, Alternative 4 would meet the surface water RAOs and be protective of aquatic life. Modeling and demonstration project results indicate that disposing of mill wastes in subsidence pits may result in a short-term local release of metals to groundwater. However, the release of metals was observed to be temporary, local in nature, and is expected to have a minor impact on surface water quality. In the long term, groundwater quality is expected to improve relative to current conditions because the flux of atmospheric oxygen and oxygenated surface water into the mine workings will be locally reduced. Hence, the groundwater RAO is expected to be addressed through long-term and permanent improvement in groundwater quality.

Alternative 5a will be protective of human health and the environment. The source materials, surface water, and sediment RAOs would be achieved in an aggressive timeframe, approximately seven years. Compared with current conditions, aboveground disposal of source materials will significantly reduce surface water loadings from mining related sources because surface runoff and sediment transport to Class P streams and their tributaries are nearly eliminated. Therefore, Alternative 5a would be protective of aquatic life.

Alternative 5b would be fully protective of human health and the environment because all source materials would be effectively isolated from human and environmental receptors and prevented from interacting with other media. Source material, surface water, and sediment RAOs would be achieved in a relatively short timeframe (five years). Metal loadings to Class P streams and their tributaries are expected to be nearly eliminated by excavating all source materials and sediments containing mill wastes, disposing of the wastes in secure, aboveground repositories, and reclaiming the excavated areas. Therefore, Alternative 5b would be protective of aquatic life.

12.1.2 Compliance With ARARs

This criterion is used to decide how each alternative meets federal and state ARARs, as defined in CERCLA Section 121. Compliance is judged with respect to chemical-specific, action-specific, and location-specific ARARs as well as appropriate criteria, advisories and guidance to be considered (TBCs). A list of ARARs identified for each alternative is in the FS report. A comparative analysis of remedial alternatives with respect to compliance with ARARs is given in Table 3.

Chemical-Specific ARARs

A list of federal and state chemical-specific ARARs is given in Table 4. A principle risk addressed in this ROD is the exposure of aquatic life from contaminants of concern in surface waters. The principle chemical-specific ARARs that the preferred alternative must comply with are the standards and criteria established under the CWA for protection of aquatic life. These standards are established by the EPA and state and tribal governments pursuant to CWA regulations at 40 CFR Part 131.

The identification of chemical-specific ARARs for surface water in the Jasper County Site is complex because divergent federal and state water quality standards and criteria exist, the existing state criteria are currently being reevaluated, and opportunities exist for developing site-specific criteria. The EPA does not consider the current Missouri WQC to be protective of aquatic life, for example, in the unclassified streams, such as the tributaries to designated perennial (Class P) streams. To address the EPA's concerns about the possible lack of state-wide protectiveness, Missouri's Water Pollution Control Program is currently in the process of revising the state's WQC. Preliminary work performed by the state indicates Missouri's revised WQC will likely be similar to current Federal standards. Although Missouri's WQC may be relevant and appropriate chemical-specific requirements for surface waters within the Jasper County Site, presently, the federal criteria are more stringent and more protective. Thus, the remedial alternatives must comply with the federal criteria under CWA regulations. When Missouri's revised WQC are promulgated, it is anticipated that the EPA will consider them to be protective, and they may become the relevant and appropriate requirements in the future as the EPA conducts five-year reviews of the remedy selected for OU-1.

In addition, the federal chronic ALCs are also considered relevant and appropriate requirements for Class P streams within the Jasper County Site because the Class P streams identified as part of the remedial actions flow into Kansas, and Kansas has adopted the federal chronic ALCs for the streams into which the Site's Class P streams flow. In the Class P streams and their tributaries, the federal chronic ALCs are considered relevant and appropriate for purposes of the comparative analysis of compliance with ARARs.

Alternative 1, the No Further action alternative, represents a continuation of current conditions. Under current conditions, periodic exceedances of surface water ARARs are expected to occur in Class P streams and more commonly in their tributaries. Although surface water quality is expected to gradually improve due to the continued reduction in chat volumes through recycling, Alternative 1 is not expected to consistently comply with the surface water ARARs.

Alternatives 2 and 3 may not be capable of achieving the greater than 90 percent reductions in zinc loads needed to comply with federal ALCs in all Class P stream segments and their tributaries under all flow conditions. Chemical-specific ARARs for surface water are

expected to be consistently met by Alternatives 4, 5a, and 5b. In addition, Alternatives 4, 5a, and 5b will result in compliance with the surface water ARARs in a relatively short timeframe, 5 to 7 years. However, monitoring of Alternative 4 will be necessary to assess any short-term increase in metal concentrations in surface water or drinking water wells.

Action-Specific ARARs

All of the candidate alternatives are equally capable of meeting the action-specific ARARs identified for the individual alternatives. A list of federal and state action-specific ARARs is given in Table 5.

Location-Specific ARARs

All of the candidate alternatives are equally capable of meeting the location-specific ARARs identified for the individual alternatives. A list of federal, state, and local location-specific ARARs is given in Table 6.

To Be Considered

Alternatives 1 and 2 are not expected to comply with the threshold criteria for terrestrial vermivores, as vegetated mill wastes will be left on site that will likely exceed the criteria. Under Alternative 2, biosolids applications alone, without deep tilling or soil amendment, are not expected to reduce total metals levels below the threshold criteria. All other alternatives are expected to comply with the total metal-based criteria.

The EPA's probable effect concentrations and equilibrium partitioning sediment guidelines are identified in Table 4 as chemical-specific TBCs for Site sediments. It is uncertain if these TBCs would be achieved under any of the candidate alternatives. However, with time, the COC concentrations in sediments should approach background levels under all the action alternatives.

12.2 Balancing Criteria

The following presents a brief description of how the alternatives developed in the FS satisfy the balancing criteria.

12.2.1 Long-Term Effectiveness

This criterion addresses the results of a cleanup action in terms of the risk remaining at the Site after the goals of the cleanup have been met. The primary focus of this evaluation is to determine the extent and effectiveness of the controls that may be required to

manage the risk posed by treatment residuals and/or untreated wastes. A comparative analysis of remedial alternatives with respect to long-term effectiveness and permanence is given in Table 7.

Magnitude of Residual Risks

The volume and acreage of mill waste left on Site and the engineering controls prescribed for stabilizing or containing the wastes at full implementation provides a means of comparing the magnitude of residual risks under each of the remedial alternatives. Alternative 1 provides no engineering controls to manage the residual risks associated with approximately 5,000 acres of land affected by mill wastes. Under Alternative 1, residual risks to terrestrial vermivores and aquatic biota would remain at or near current levels; Alternative 2 would result in less affected lands and would manage the residual risks. Of the action alternatives, Alternative 3 would result in the greatest land area affected by mill waste and the residual risks would be the highest of the action Alternatives. The magnitude of residual risks is potentially low under Alternative 4 because source materials are permanently disposed underground. The footprints of the filled subsidence pits, and the biosolids treated areas will require long-term protection to manage residual risks. Groundwater monitoring is also necessary for managing and assessing residual risks over time. The residual risks under Alternative 5a would be essentially the same as under Alternative 4, except that the area occupied by permanent waste repositories is larger under Alternative 5a, and Alternative 4 requires groundwater monitoring. Under Alternative 5b even less affected lands would remain. Based on the above evaluation, the magnitude of residual risks is lowest under Alternatives 4, 5a, and 5b.

Adequacy and Reliability of Engineering Controls

The comparison of alternatives with respect to the adequacy and reliability of controls is based on a variety of factors, such as treatability testing results, technology literature reviews, modeling results, and engineering judgement.

Under Alternative 1, mill wastes are left on Site with no vegetation or engineered cover systems. Leaving source materials uncovered and unvegetated is not adequate or reliable for preventing risks to aquatic life. Alternative 1 does not address risks to terrestrial vermivores because a large volume of wastes will remain that exceed the threshold criteria for vermivores.

Direct vegetation, as prescribed under Alternative 2, may be only partially adequate for reducing seepage and metal loadings to surface water, even though the use of biosolids provides a treatment effect on the metals in the wastes. From an engineering perspective, the direct revegetation of source materials prescribed under Alternative 2 is considered the least permanent or reliable of the cover systems proposed under the action alternatives.

The simple soil covers prescribed under Alternative 3 more adequately and reliably reduce infiltration and seepage. Although Alternative 3 is an improvement over Alternatives 2, Alternative 3 is only partially adequate for reducing seepage, metal loadings to surface water, and risks to aquatic life. Alternative 3 is adequate and reliable for addressing risks to terrestrial vermivores.

Excavation of source materials and disposal in subsidence pits, as described under Alternative 4, represents the most permanent and reliable method of meeting the RAOs pending successful monitoring of groundwater over time. This alternative permanently contains the source materials in pits which prevents direct contact exposures for terrestrial life and humans, and significantly reduces the need to rely on previously planned, but less reliable, ICs to reduce human health risks from direct contact with the source materials. By removing the source materials from the flood plains and erodible areas and containing it in disposal pits, Alternative 4 permanently eliminates runoff and infiltration due to the source material waste piles from contaminating surface waters.

Alternatives 5a and 5b are highly effective known technologies. Alternative 4 is somewhat more reliable and permanent because source materials are disposed underground, instead of aboveground. Although the prescribed repositories in 5a and 5b are secure, they would require perpetual maintenance and ICs to prevent disturbance over a larger area compared to the maintenance that will be require by Alternative 4, due to the type of waste caps involved and the acres of disposal area.

12.2.2 Short-Term Effectiveness

This criterion addresses the effects of the alternative during the construction until the cleanup is completed and the selected level of protection has been achieved. A comparative analysis of remedial alternatives with respect to short-term effectiveness is given in Table 8.

Risks to the Local Communities and Workers

Potential risks to local communities during remedial actions are similar under all candidate alternatives. The conventional risks posed by earthmoving and construction activities are readily mitigated through engineering controls, safety training, and public involvement efforts. Potential risk to workers during remedial actions is similar under all of the action alternatives.

Potential Environmental Impacts

The implementation of the action alternatives may result in environmental impacts, including potential nitrogen and phosphorus loading to surface water, depletion of non-renewable soil resources, and degradation of riparian and aquatic habitat.

Improper or excessive biosolids applications could result in impacts to surface waters caused by increased nitrogen and phosphorus. Alternatives 2 and 3 rely most heavily on biosolids applications to achieve the RAOs, and the potential environmental impacts are a particular concern under these two alternatives. Under Alternative 3, several hundred acres of mill waste will be capped with soils. Alternative 4 also relies on biosolids application, but to a much lesser degree than Alternatives 2 and 3. During the early stages of revegetation, these capped areas will be susceptible to erosion. Local streams could receive elevated sediment loads during rainfall events.

The depletion of non-renewable soil resources is a potential environmental concern. Alternative 2 relies on borrow soil the least. Alternatives 4 and 5b rely on borrow soils much less than Alternatives 3 and 5a, and soil depletion is not expected to result in significant environmental impacts under Alternatives 4 and 5b.

Placement of mining wastes in the pits under Alternative 4 could result in short-term increases in metals concentrations to groundwater which may threaten nearby wells and surface waters if disposal pits are located near water wells or surface waters. Locating pits in these areas will be avoided to the extent practical and monitoring groundwater chemistry will identify increases in metals concentrations.

Removing sediments from stream channels, riparian areas, and wetlands may damage sensitive aquatic ecosystems. Proper timing of sediment removal activities will minimize this damage. These environmental risks are similar under each alternative except Alternative 1, which does not involve sediment excavation.

Based on the above evaluation, the actions prescribed under Alternatives 4 and 5b have the least potential for environmental impacts.

Time Until RAOs Are Achieved

Alternative 2 requires significantly longer time to implement than other alternatives due to the limited supply of biosolids available within a reasonable distance from the Site. If additional sources of biosolids, such as poultry litter, are available, the time frame required to implement Alternative 2 could be shortened. The timeframe required to implement Alternative 3 is intermediate between Alternative 2 and Alternatives 4, 5a, and 5b. At full

implementation, the surface water and source material RAOs may not be fully achieved under Alternatives 1, 2 and 3. RAOs are achieved under Alternatives 4, 5a, and 5b in approximately the same time frame, between 5 to 7 years.

12.2.3 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume (TMV) of the contaminants. A comparative analysis of remedial alternatives with respect to reduction of toxicity, mobility, or volume through treatment is given in Table 9.

Alternatives 2, 4, and 5b are the alternatives expected to achieve TMV reduction. Alternative 2 incorporates application of biosolids, which may provide some treatment and stabilization of the metals. Under Alternative 4, subaqueous mill waste disposal is expected to result in remineralization of metal oxides as insoluble sulfides, thereby reducing the mobility of the metals. This method of treatment would be permanent and irreversible unless the mill wastes were removed from subsidence pits and exposed to oxidizing conditions. Under Alternative 5b, the only treatment occurs in passive anaerobic wetland treatment systems as sulfate-reducing bacteria remineralize metal oxides to insoluble sulfide forms, thereby reducing metals mobility. The concentration of metal in the waters treated by the passive anaerobic treatment systems is minor compared to the metal contained within source materials, thus treatment volumes under Alternative 5b are considered negligible.

12.2.4 Implementability

This criterion addresses the technical and administrative feasibility of implementing a cleanup and the availability of various services and materials required during its implementation. All the alternatives are readily constructable. However, the passive anaerobic treatment systems prescribed under Alternative 5b are innovative and few large-scale systems have been constructed. A comparative analysis of remedial alternatives with respect to implementability is given in Table 10.

The implementation of all the action alternatives will require varying degrees of coordination between the EPA, state and local agencies, landowners, and chat recyclers. Under any circumstance, administrative implementability is expected to be complicated by the fact that none of the parties that would be implementing the remediation own the lands that would be involved in the remedy.

Alternative 1 requires no materials to implement. The availability of biosolids and borrow soils affects the implementability of the action alternatives. Because of the limited supply of biosolids available within a reasonable distance from the Site, the timeframe for implementing Alternative 2 depends on the amount of biosolids used. The timeframe for

implementing Alternative 2 may be relatively long (up to 30 years) due to the large volume of biosolids needed to implement the alternative and the availability of the biosolids. However, the use of poultry litter or other biosolid sources may shorten this timeframe. Alternative 3 relies less on biosolids applications and can, therefore, be implemented in a shorter timeframe (12 years). The timeframes for Alternative 4 (7 years), 5a (7 years), and 5b (5 years) are not dependent on biosolids applications because these alternatives use significantly less biosolids than Alternatives 2 and 3.

Alternative 2 uses no borrow soils. However, when simple soil covers are prescribed instead of biosolids applications under Alternative 3, a very large amount of borrow soil is used to accomplish approximately the same level of waste containment. The extremely large volume of soil needed to implement Alternative 3 may preclude its selection as a preferred alternative because the non-renewable soil resources of Jasper County may be depleted.

Alternatives relying on ICs to regulate chat recycling are not readily implementable. The administrative inefficiencies in developing and implementing legal agreements may preclude selection of such ICs as a component of the preferred alternative because of the required level of coordination with chat owners/operators and the required operation and maintenance of chat recycling which state and local officials would need to perform.

12.2.5 Cost Effectiveness

This criterion addresses the direct and indirect capital cost of the remedy. Operation and maintenance costs incurred over the life of the project, as well as present worth costs, are also evaluated. This comparison of costs among alternatives is presented in Table 11.

Alternative 4 is considered the most cost-effective alternative. Although the cost of Alternative 2 is less than Alternative 4, Alternative 2 is considered less effective and may not meet the RAOs. The significant increase in costs for Alternative 3 is not justified since Alternative 3 is considered less protective than Alternative 4. Alternative 5a and 5b are both effective but are significantly more costly than Alternative 4.

12.3 Modifying Criteria

The two modifying criteria of community and state acceptance are intended to assess the views of both groups regarding various cleanup approaches. The EPA has held numerous meetings with the MDNR and the Jasper County Citizen's Task Force to discuss the effectiveness of sub-aqueous disposal. The EPA held a public meeting and opened a comment period to assess the publics' opinion and preference for a remedy. Comments received from the public indicate that the community fully supports Alternative 4 as the preferred alternative. MDNR supports the modified Alternative 4 as the Selected Remedy as presented in this ROD.

13.0 Selected Alternative

This section presents the detailed description of the EPA's selected alternative, which is Alternative 4 in the FS, with the exception that the EPA has modified the alternative slightly by eliminating the chat recycling ICs, and revising the action levels based on comments received from the public. Alternative 4 is a remedial alternative based on excavating and disposing of source materials in on-site subsidence pits for addressing the principal threats, i.e., risks to aquatic biota caused by surface water containing COCs in concentrations exceeding ALCs, potential risks to terrestrial vermivores that may be caused by ingesting metals from soils exceeding threshold criteria, and exposure of people to metals-contaminated soil and mine wastes. This alternative relies on excavation and on-site disposal and prescribes a high degree of mine and mill waste consolidation to address the RAOs. In addition, the timeframe for this alternative is aggressive because the schedule is not dependent on the availability of biosolids or the time required to construct simple soil covers on numerous waste containment cells. Detailed costs associated with the implementation of Alternative 4 are presented Table 12. The total cost estimated for this Alternative is $58,543,332 for construction, with an estimated annual operation and maintenance cost of $22,500.

The detailed description of Alternative 4 is presented in the following subsections.

13.1 Selected Alternative Rationale

Alternative 4 relies on the disposal of source materials in on-site subsidence pits to achieve significant reductions in COC loadings to surface waters, as well as reducing risks to terrestrial vermivores, and to people who may move into residences constructed in contaminated areas. In contrast to the current situation in which mill wastes have been placed aboveground and are exposed to erosion and natural weathering forces, Alternative 4 takes advantage of the naturally-occurring geochemical conditions underground, especially in flooded mine workings, to arrest the natural weathering processes and create favorable conditions for the formation of relatively insoluble mineral assemblages. A short-term release of metals to groundwater after placing the mill wastes in the subsidence pits is expected. However, the impacts to surface waters should be localized and the affect on surface water metal loading relatively minor when compared to the significant role played by surficial waste deposits as a metals source during high-flow conditions.

A growing body of engineering experience and scientific investigation points to underground or underwater (subaqueous) disposal of mining and milling wastes as a cost-effective and environmentally safe disposal method. The results of batch leach tests of Galena, Kansas area mine wastes were used to model the subaqueous disposal of mill wastes. The report concluded that placing mill waste underground in subsidence pits can significantly reduce the transport of metals from the wastes to surface waters. Recent site-specific work performed by MDNR in the Logan Uplands area of the Oronogo/Duenweg DA supports the conclusion that

subaqueous disposal of mineralized waste rock does not adversely affect groundwater quality. To further evaluate and document the effects of this alternative, a subsidence pit demonstration project was initiated in the Waco DA in July 2001. This demonstration project was designed to evaluate the possible changes in local groundwater chemistry and surface water quality near the demonstration disposal pit and confirm that disposal of mill wastes in subsidence pits in general would have no long-term adverse impacts on groundwater or surface water. The demonstration was completed in the spring of 2003. The study showed that filling a pit with approximately 60,000 cubic yards of tailings with high concentrations of zinc did not result in a long-term increase in zinc concentrations in the groundwater.

Filling open subsidence pits should also reduce the influx of oxygen into the shallow aquifer. Reducing the oxygen flux into the shallow aquifer will improve groundwater quality by reducing the oxidation of pyrite and other sulfide minerals remaining in the underground workings. The rationale for developing an alternative based on subsidence pit disposal is based on these findings and conclusions. An incidental benefit of this alternative would be the stabilizing effect that backfilling would have on mine collapse features in the Site. Filling selected subsidence pits would address potential human health risks associated with the physical hazards posed by open pits, as well as eliminate some nuisance trash pits in the area.

Due to the extremely complex and varied nature of the site and the innovative nature of the preferred alternative, a flexible approach with respect to applying technologies from other alternatives may be necessary during implementation. In other words, components of other alternatives in the FS, such as biosolid treatment and capping of certain source materials may be necessary as conditions warrant. Where wastes are remotely located from disposal pits, or where removal of wastes from deep, depressions would result in excessively deep excavation and water ponding, capping of the wastes with simple soil covers will be used to encapsulate the wastes in place.

13.2 Detailed Description of the Selected Remedy

The following section provides a detailed description of the EPA's preferred remedy for cleanup of the source material on the site.

13.2.1 Engineered Cleanup Actions

Specific actions implemented under Alternative 4 include the engineering components described in the FS with respect to remediation of the source materials. As noted above, the preferred alternative is slightly modified from the description of Alternative 4 in the FS with respect to the ICs discussed in Section 13.2.2 because chat recycling is eliminated as a component of this ROD, and the selected action levels for the Site. The specific actions of the selected alternative include the actions listed below. The order of priority for cleanup of the source materials will be to address the wastes located in close proximity residential areas,

followed by cleanup of wastes that present the highest risk to aquatic life. Waste areas that do not present significant human health or aquatic risk, but present risk to the terrestrial environment will be cleaned up as the last priority.

Source Removal and Disposal in Subsidence Pits

In- and near-stream barren chat, vegetated chat, and tailings; barren chat, vegetated chat, and tailings located in the flood plains and tributaries; upland chat and tailings exceeding terrestrial and human health action levels would be excavated and placed in mine subsidence pits located in proximity to the source material. Backfilling the pits would be accomplished by simply end-dumping and/or pushing the mill wastes into the pits with excavation equipment.

To the extent possible, tailings and chat would be placed at least a meter below the seasonal low static water level in the pits. Reducing repeated wetting and drying of the wastes as a result of seasonal water level fluctuations is considered important for arresting weathering, oxidation, and acid generation processes, and preventing further leaching of metals from the wastes. Relatively inert materials, such as development rock or low-concentration chat would be used to fill the zones where water levels may fluctuate. Flooded pits that contain high quality habitat for fish and wildlife, and contain low concentrations of metals in the water will not be used for disposal because they do not present a risk to human health or the environment. There appears to be sufficient pit space available on the Site to warrant saving good quality habitat.

Upland Source Materials

Upland barren chat and tailings that do not exceed action levels established to protect terrestrial and human health would be left in place because they do not pose a risk to human health and the environment. Upland vegetated chat and transition zone soils that exceed human health and terrestrial cleanup criteria would be deep tilled to reduce metal concentrations and revegetated. Biosolids would be added to provide some treatment of the metals in these sources, and to improve soil structure for plant growth.

Sediment Removal

Sediments in the intermittent tributaries flowing from the sources areas to the Class P streams will be removed subsequent to the cleanup of the sources draining to the tributaries. The sediments will be removed to a depth where background metals concentrations or bedrock is encountered, which ever is shallower. Sediment basins and traps will be constructed at the mouths of the tributaries to be remediated to mitigate sediment transport to the Class P streams during the cleanup actions. Remediated tributaries will be restored by lining the channels with clean gravel and stabilizing the banks with natural vegetation.

Sediment removal actions in Class P streams would be limited to delta deposit built up at tributary mouths. Generally, all the sediments in the deltas exceed screening criteria for aquatic organisms. Therefore, all the sediment delta deposits at the mouths of the tributaries exposed

above the waterline at low-flow conditions will be removed. Extensive removal is not anticipated under this alternative because the estimated volume of delta deposits is small based the site sediment surveys conducted jointly by the EPA, the MDNR, and NewFields in November 1999 and April 2003. The excavated sediments would be disposed in subsidence pits with the other source materials. Removal of the delta deposit sediments will occur at each tributary at the completion of the removal of the sediment in the individual tributary. It is anticipated that all sediments from the tributaries draining source areas to the Class P stream will require complete removal up to the source areas. Once the tributaries have been cleaned of sediments, the channels will be restored to as near natural condition as possible. This would include replacement of clean gravel in the channels and bank stabilization.

This ROD is establishing numeric action levels for cleanup of the tributary sediments and delta deposits of 2 ppm cadmium, 70 ppm lead, and 250 ppm zinc. These concentrations were derived from the average concentration of background designated soil values. The EPA also assessed screening values for sediments in the consensus-based Threshold Effects Criteria (TEC) for freshwater, developed by MacDonald et al. (2000). The MacDonald values are recommended as numeric sediment quality criteria because TEC values are intended to predict the absence of toxicity in sediments. Although TEC values are often used for the purpose of ecological screening to determine contaminants of potential ecological concern, they also provide a reliable basis for classifying sediments as toxic or not toxic to sediment dwelling organisms. Comparing the threshold effects concentration to the probable effects concentration give a range of 1 to 5 ppm (average of 3) for cadmium, 32 to 128 ppm (average of 80) for lead, and 121 to 459 ppm (average of 290) for zinc. The average background soil concentrations for the Site fall with in this range of screening values, and are slightly lower than the average recommended MacDonald values.

During implementation of the remedy, the EPA will initiate the surface water quality monitoring plan to assess the effectiveness of the source removal action on reducing surface water quality to meet Federal ALC. If at the second Five Year Review after completion of the remedy (10 years or less), conducted as required for the Site, monitoring data indicated the Federal ALC has not been achieved, the EPA will assess the feasibility of conducting additional actions. These may include the removal of sediments from the Class P streams, which is currently not part of the remedial actions selected in the ROD. Additional action may be taken under an amendment to this ROD, or as part of a new operable unit. If the assessment of data indicates the need for additional source material (i.e. mine waste or soil) removal is required, those additional actions would be conducted under an amendment to this ROD. Should the data indicate that sediment removal from the Class P streams is necessary to achieve the federal ALC, those actions would be conducted under a separate OU and ROD. Should the EPA determine that an additional OU and ROD for sediments is warranted, sediment removal activities would be conducted simultaneously with sediment actions in the Spring River drainage in Kansas and Oklahoma.

Recontour, Revegetate, Soil Amendments, Stabilization

A variety of drainage and erosion control measures will be implemented during and after excavation of the source materials to manage storm water runoff and reduce metal and sediment loadings to Class P streams and their tributaries. Excavated areas will be recontoured and revegetated following complete removal of the mill wastes in order to control runoff and prevent surface erosion. Deep tilling would be performed to improve soil structure and moisture retention characteristics by blending the organic matter content of different soil horizons, as well as reducing contaminant concentrations, to reduce risks to human health and terrestrial biota, and improve soil function. The soils would be amended with biosolids to supplement the soil organic matter content and facilitate revegetation, which may also provide some treatment to any residual metals not excavated during subaqueous disposal. Excavated areas will be contoured to promote proper drainage, preventing ponding of water in the excavated areas. Excavated areas will be revegetated using native, warm-season grass, or other grass types, dependent on the wishes of the property owner. Stream channels and banks from which source materials have been removed would be stabilized through the use of appropriate restoration techniques, such as recontouring, regrading, revegetating, or installing erosion barriers, stone armor, or riprap. Natural vegetation, such as willows or cedar revetments, would be used to stabilize remediated channels instead of stone rip-rap, where practical.

Selection and Capping of Disposal Pits

Pits will be evaluated during the remedial action for their suitability as disposal sites. Pits directly connected to the surface water system, containing highly oxygenated water, or exhibiting high groundwater flux will preferably be excluded from consideration as disposal sites. Pits within ½ mile of Class P streams with exceedances of ALCs will also be excluded depending on the degree of karst development or mining-related conduit flow. Pits within one-mile upgradient of shallow drinking water wells that are still in use will be excluded from consideration for disposal. Pits exhibiting low dissolved oxygen concentrations and low oxidation/reduction potential will be considered good candidates for disposal sites. The filled pits will be capped with geo-composite soil covers to nearly eliminate infiltration of oxygenated rainwater, thereby reducing the weathering of the disposed wastes. Actions, such as mounding the cover systems and diverting surface flows away from the capped pits will also be taken to reduce the infiltration of oxygenated water into the disposal pits. In- and near-stream transition zone soils exceeding the action level for human health and terrestrial risk or soils from beneath excavated chat piles will be excavated and used in the construction of the soil cover systems. To prevent damage to the cover systems due to consolidation and differential settling of the mill wastes placed in the pits, adequate time (six to twelve months), will be allowed for the mill wastes to consolidate in the subsidence pits prior to attempting to install the cover systems. Any subsidence that occurs during the consolidation period will be filled in with additional mill wastes or soils to provide positive slopes and adequate drainage for the cover system. Erosion control measures will be installed at each filled pit to control runoff prior to the cap installation during the settling period. Only low-concentration mill waste or development rock will be used to fill settled areas in the pits after subsidence of initial materials disposed prior to the cap installation.

In addition, groundwater monitoring wells will be installed around the first few pits where disposal occurs to confirm the results of the Waco pilot study concerning the short-term and long-term release of metals. The monitoring data collected from the wells will be used to further define the appropriateness of various types of pits for disposal, and refine disposal criteria. Monitoring will be conducted weekly for the first two months, monthly for months three through six, quarterly for the remainder of year one, then semi-annually until the first Five Year Review.

Shaft Plugging

Surface water and sediment RAOs will be addressed through the source material and sediment removal options described above. Where practical, the groundwater RAO will be addressed by installing shaft plugs and diversion ditches to reduce the amount of surface water entering the mine workings. The purpose of these actions will be to reduce point and non-point groundwater discharge from mining-related sources to streams.

Thorns DA Open Mine Pits

The acidic overburden from the Wild Goose open pit mine in the Thorns DA will be excavated and disposed underwater in the TH-12 pit. Other mill wastes from the Thorns DA will also be disposed in this open pit, as well. Due to the size of the pit, however, there is not enough mill waste or overburden in the Thorns DA to completely fill the Wild Goose open pit TH-12. Therefore, the EPA Will assess hauling wastes from other DAs to facilitate complete filling of the pit. Water displaced by the filling of the pit will be neutralized and treated with lime in a temporary mobile treatment plant to remove the cadmium, iron, lead, and zinc prior to discharging it to the nearby Center Creek tributary (CC Trib 6). An open limestone drain will be installed at the outlet of the pond to neutralize any subsequent discharges that may occur following the remedial actions, if the pit is only partially filled. Lands exposed by the excavation of the reactive overburden will be deep tilled, limed, and amended with biosolids or other organic matter and revegetated the same as other excavated mill waste deposits.

Filling of the Wild Goose pit, with its current low pH waters, presents a special concern for subaqueous disposal of wastes. The acidic nature of these waters could mobilize metals and result in groundwater conditions not suitable for subaqueous disposal. The acidic overburden may need to be treated to reduce acidity prior to placing it into the pit with mill wastes. Only partially filling the pit will result in open water at the surface that could serve as a continual input of oxygenated water, thereby negating anaerobic conditions to stabilize metals. If open surface water is left in the pit, it could be an attractive nuisance and could harm wildlife, particularly waterfowl. This scenario of disposal needs to be fully studied and modeled to show if it is effective prior to implementing action at the pit. Pilot studies will be required to assess the effectiveness of treatment technologies prior to full implementation of the filling action. It is likely, that is the treatability and pilot study results will show that the pit can be filled without significant metals release, but that the pit should be completely filled and capped.

13.2.2 Institutional Controls

The ROD for the smelter-affected and mining-affected residential yard soils in Jasper County (OU-2/3) prescribes ICs to reduce future exposure of children to unacceptable concentrations of lead in soils in new residential construction in all undeveloped contaminated areas. Those ICs were envisioned to consist of a Site-wide zoning ordinance that will control new development in mine-affected areas, building codes or health ordinances that will require remediation of soils exceeding the risk-based clean-up standards in new residential construction, and deed restrictions on excavated yard soil repository sites to protect them from human disturbance. The ICs are being considered and developed through a cooperative effort between the EPA, Jasper County, and the city of Joplin, Missouri. However, to date, the implementing ordinances have not been enacted. Thus, the preferred alternative for OU-1 incorporates the ICs that were required under OU-2/3 and allows the county and cities greater flexibility in adopting such ICs in light of the more permanent and reliable proposed action in this ROD, i.e., disposal and containment of the source materials.

The selected alternative for OU-1 includes a site-wide building ordinance that would be enacted by Jasper County, similar to the health ordinance prescribed in the OU-2/3 ROD. The EPA has discussed this IC with jasper County. The county would propose a building ordinance for all undeveloped areas within the site that requires the builders of residential homes to obtain a permit for construction. Conditions of the permit would require soil testing to determine the lead concentration of the soil in the yard area of the home. The EPA will work with the county to develop appropriate sampling procedures to ensure the reliability of the results. An occupancy permit will only be granted by the county if soil lead concentrations are below 400 ppm and cadmium will be below 75 ppm. Builders will be required to properly cleanup soils exceeding these levels prior to receiving the occupancy permit. The EPA will provide funding to Jasper County to establish and implement the building permit ordinance. After the completion of the OU-1 cleanup, the surficial source materials (mine and milling wastes) will be contained in the subsidence pits. Thus, the building ordinance controlling residential development will no longer be required. The selected alternative does not require, but tolerates a planned termination date for the county building ordinance if the county prefers that the ordinance only be effective for a limited term. For example, the ordinance could terminate upon completion of the remedial action.

The selected alternative prescribes disposal of mine and mill wastes in mine subsidence pits followed by capping of the wastes. Some waste areas may be contained and capped in place with soils or biosolids. All capped areas and biosolids treated areas will require ICs to prevent disturbance of the cap thereby protecting the wastes. These ICs will likely consist of restrictions or easements placed on the property deeds for the areas where the disposal or containment occurs. The restriction will prevent the development on, and disturbance of, the caps placed over the wastes. Restrictive covenants may be entered into with owners of the disposal property for protection of the disposal and capped areas.

This ROD excludes chat recycling as a component of the Selected Alternative. The effective and more permanent engineering control components of the selected alternative eliminate the need for legal agreements to control recycling. Reducing risks to human health and the environment from chat recycling through legal agreements with individual owners/operators is administratively infeasible because of the large size of this Site, about 5,000 acres of mine waste piles and 500 owner/operators, and the far-reaching impact of such agreements, i.e., end uses, accumulation, speculation, storage, surface water protection, and final closure. Moreover, the legal agreements would duplicate ARARs under the Clean Water Act (CWA) that regulate discharge of pollutants and contaminants into surface waters. If enforcement actions are needed to control surface water pollution from mine waste piles prior to completion of the engineering components selected in this ROD, the CWA may be used on a case-by-case basis to regulate surface water pollution caused by chat recycling.

13.2.3 Health Education

The ROD for OU-2/3 required the implementation of a health education program in Jasper County to supplement the residential soil cleanup. The EPA has been funding the Jasper County Health Department to implement that health education program since 1996. Since human health exposure risks due to direct contact with source materials containing the metals contamination is possible until completion of the mine and mill waste cleanup described in this ROD, the EPA will continue to fund the health education program until the cleanup of OU-1 is complete. When the cleanup action is completed for OU-1, and at the completion of additional actions anticipated under OU-2/3, which essentially means that Superfund Site sources for human exposure have been addressed, the health education program will no longer be funded by the EPA.

13.2.4 Stream Monitoring

One of the primary RAOs for the selected alternative for surface water is to reduce the exposure of aquatic organisms in the Class P streams to COCs where federal ALC are exceeded. The EPA believes the actions taken under the preferred alternative will reduce concentrations of metals in the Class P stream to less than federal ALC based on hardness. These actions include removal of all source material with erosion potential to the streams, tributary sediments, and all sediment delta deposits above the low water line at the mouths of the tributaries draining source areas into the Class P streams. During the remedial action for OU-1, the EPA will establish a water quality monitoring program for the Class P streams to assess the effectiveness of the remedial action on reducing metals loads. The EPA will collect monitoring data which will be used during the five-year review process, and will be collected and assessed at each review until the metals concentrations are in compliance with the ALC. Should the goal of achieving the ALC fail to be achieved within two Five-Year Review periods (10 years) after completion of the remedial action, or if water quality standards established by states or tribes for downstream receiving surface waters show no improvement within this 10-year period, the EPA will assess the feasibility and practicality of conducting additional actions at the Site to further reduce the metals concentrations in the Class P streams. Should additional actions be required,

the work may be conducted under an amendment to this ROD for OU-1, or if warranted by extensive basis-wide action, a new operable unit for sediment removal may be established to address the Class P streams at the Site.

13.2.5 Operation and Maintenance

An O&M program will be established to maintain the caps on the disposal areas and to maintain other engineering components of the preferred alternative, e.g., areas of biosolids or soil application where wastes were left in place, groundwater monitoring, and revegetated areas. The state will be responsible for the O&M beginning one year after the completion of the remedial action. If the local government enforces the ICs, the state remains responsible for O&M of such local government controls.

The state's O&M responsibilities will include a monitoring program to assess the effectiveness of the ICs. The monitoring program will provide annual reports to the EPA detailing the development in areas of concern to protect engineering components. Monitoring requirements will be assessed during the five-year review process and may be modified or reduced as appropriate based on data collected as part of the reviews.

14.0 Statutory Determination

Under its legal authority, the EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this Site must comply with applicable or relevant and appropriate environmental standards established under federal and state environmental laws, unless a statutory waiver is justified. The selected remedy also must be cost effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

14.1 Protection of Human Health and the Environment

The selected remedy will protect human health and the environment by achieving the Remedial Action Objective through a combination of engineering measures and institutional controls. Existing terrestrial and aquatic risks from exposure to metals contaminated source materials will be mitigated by removal and disposal of the source materials in mine subsidence pits. Future risks to human health will be reduced by source removal and implementation of institutional controls that will ensure proper construction of residential dwellings in contaminated areas.

There are no short-term threats associated with implementation of the remedy that cannot be readily controlled. In addition, no long-term adverse cross-media impacts are expected from the remedy.

14.2 Attainment ARARs

Compliance with ARARs is required of the selected remedy unless a waiver of an ARAR is justified. The selected remedy is expected to comply with all ARARs, presented in the attached tables. ARARs for the selected remedy are identified and categorized as either "Applicable" or "Relevant and Appropriate" in Table 4 through 6. These tables also describe the requirements for each ARAR.

14.2.1 Chemical-Specific ARARs

The chemical-specific ARARs are presented in Table 4. The selected remedy is expected to comply with all identified requirements through excavation and disposal of the source materials and selected sediments.

14.2.2 Action-Specific ARARs

The action-specific ARARs are based on activities and technologies to be implemented at the site. The excavation and disposal activities undertaken by the selected remedy will attain the action-specific ARARs identified in Table 5.

14.2.3 Location-Specific ARARs

Compliance with location- and action-specific ARARs will be addressed during the remedial design of selected remedy which requires excavation and disposal of metals contaminated source materials. However, no remedial design problems resulting in noncompliance are anticipated.

The location-specific ARARs that will be attained by this remedial action are based on the location of the Site and the effect of the hazardous substances on the environment. The response actions undertaken by the selected remedy will attain the location-specific ARARs for historic preservation, archeological areas, and endangered species. These location specific ARARs are identified in Table 6.

14.3 Cost-Effectiveness

The selected remedy is cost-effective because it will provide overall effectiveness proportional to its costs. The selected remedy will achieve the remedial action objective, and thus effectively reduce unacceptable risks to human health and the environment, at an estimated cost of $58,543,000 million. The selected remedy is the least expensive remedy that is fully

protective of human health and the environment, and is selected because it is the most protective, reliable, and permanent of the alternatives considered, and is the alternative preferred by the public.

14.4 Utilization of Permanent Solutions and Alternative Treatment Technology to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for this remedial action. Disposal of the wastes in subsidence pits, as opposed to surface disposal and capping, provides the most permanent disposal of the identified remedial actions. The other actions which are part of the selected remedy, institutional controls and monitoring, are not as permanent as the engineering actions, but will still provide a high degree of long-term effectiveness.

The selected remedy provides the best balance among the alternatives evaluated with respect to the evaluation criteria. The EPA relied strongly on the issue of permanence and reliability, as well as community acceptance, in selection of the remedy. The selected remedy best meets the statutory requirement to utilize permanent solutions to the maximum extent practicable.

14.5 Preference for Treatment as a Principal Element

The selected remedy effectively reduces risks through a combination of engineering and institutional controls, and includes treatment technology to the maximum extent possible. Subaqueous disposal of source materials is expected to create anaerobic conditions in the subsurface which will reduce the solubility of metals in the wastes, limiting their migration.

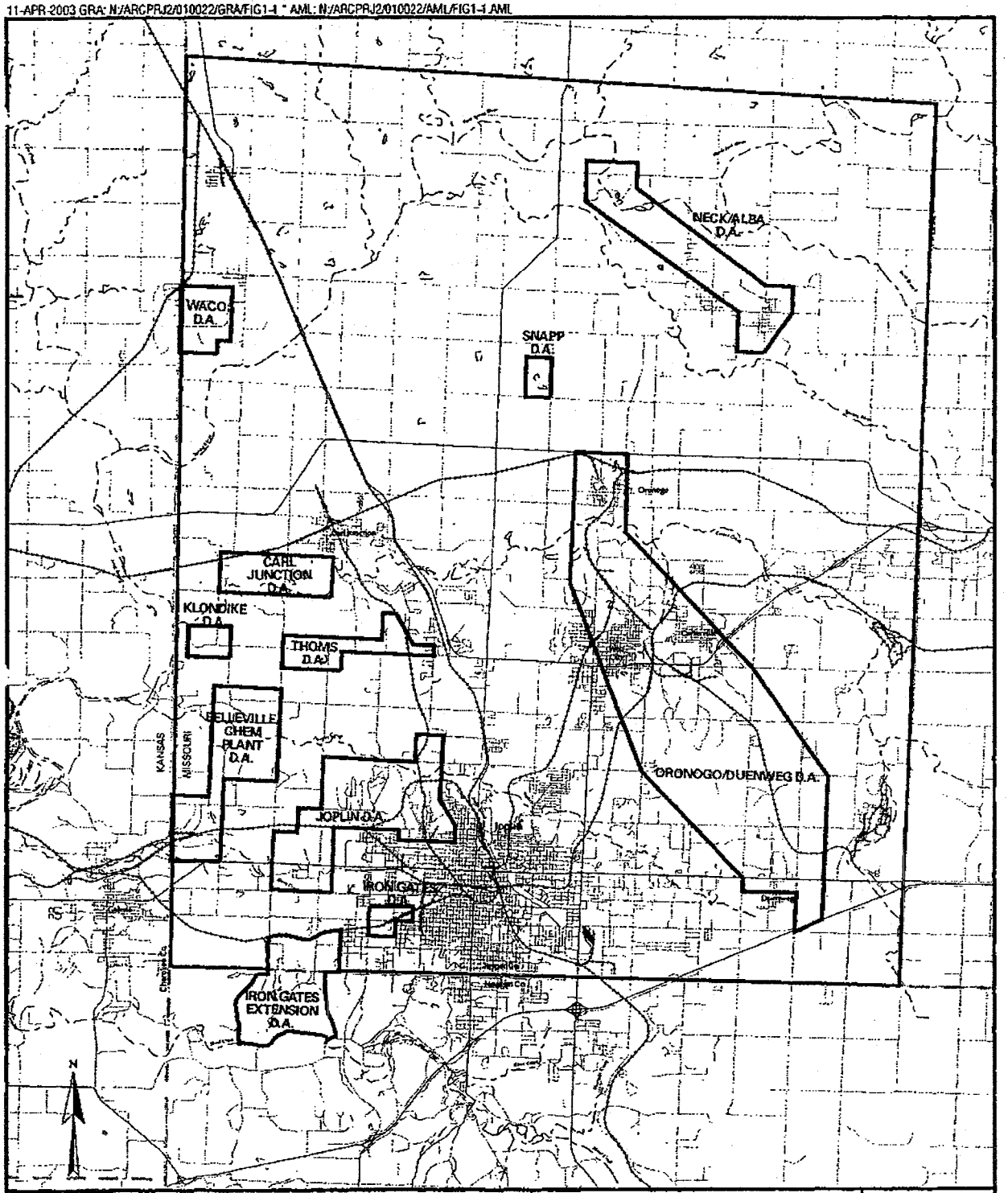
15.0 Documentation of Significant Changes

This Record of Decision is essentially the same as presented in the Proposed Plan released for OU 1 in July, 2004, with the exception of the action levels specified for cleanup, and the cost of institutional controls. The Proposed Plan presented action levels of 800 ppm lead, 40 ppm cadmium, and 6,400 ppm zinc to protect the terrestrial environment. Local health officials requested the EPA to lower the action level for lead to 400 ppm. This request was made due to the fact that the county is anticipating establishing a building ordinance for residential construction in contaminated areas that would require soil in yards to be less than 400 ppm lead. The health officials noted that unless the Site sources were remediated to less than 400 ppm lead, the building ordinance, health education, and funding support for both would be required in perpetuity. The cost estimate prepared for Alternative 4, the selected remedy, in the FS assumed all upland chat and tailings will exceeded the terrestrial action level for lead of 800 ppm. Lowering the action level for lead from 800 ppm to 400 ppm to provide additional protection for future human health did not increase cost to remove and dispose chat and tailings. The amount of transition zone soil requiring removal by lowering the action levels resulted in an additional 300 acres and increased costs by approximately $1,091,000. Additionally, the EPA inadvertently left out the appropriate cost of institutional controls from the Proposed Plan. Costs for the ICs increased the Site costs by $1,600,000. However, the EPA believes the Proposed Plan over

estimated the amount of biosolids required to complete the remedial action. The FS assumed 50 tons per acre of biosolids would be placed in all cleanup areas after excavation. The EPA believes 10 tons per acre is a more reasonable amount to provide nutrients for plant growth in the excavated areas. Vegetated chat areas will be treated with 75 tons per acre. This reduction in the amount of required biosolids reduced cost by $4 million. Overall, the costs presented in this ROD are $3.1 million less than presented in the Proposed Plan.

The EPA developed terrestrial cleanup criteria for the Site during the remedial investigation and feasibility study process. These numbers were developed and selected in the "Addendum to the Baseline Ecological Risk Assessment" and the "Technical Memorandum: Risk Management Considerations for Terrestrial Vermivores". The cleanup criteria were derived by calculating soil concentrations, using a regression analysis between soil concentrations and measured earthworm and soil invertebrate concentrations, which would result in a hazard index (HI) of 1 for shrews. Subsequently, the EPA has reassessed these numbers, using different methods, to confirm their appropriateness for protecting the environment. The EPA has determined that the soil cleanup criteria, as developed using the regression analysis, may result in an HI between one and 10. This ROD is selecting the cleanup criteria developed in the Technical Memorandum and these criteria along with the fact that all erodable waste will be addressed, will provide for a protective remedy. However, the EPA acknowledges the uncertainties in accurately determining an HI using either of these different methods, including the regression analysis calculations. The EPA understands that the Natural Resource Trustees for the Site are conducting additional studies, including bird studies, which may refine the risk to the environment from contaminated soil. The EPA will review and assess these studies, and may collect additional data, at a minimum during the Five-Year Review process, to determine the protectiveness of the cleanup criteria established in this ROD. Additional cleanup action to lower metals concentrations in mine waste areas may be conducted, if warranted, based on the results of these Five-Year Reviews analyses.

11-APR-2003 GRA: N:/ARCPRJ2/010022/GRA/FIG1-1 * AML: N:/ARCPRJ2/010022/AML/FIG1-1.AML



EXPLANATION

- Stream or River
- Site Boundary
- Designated Area
- Roads

MFG, Inc.
consulting scientists and engineers

SCALE IN FEET

13000 0 13000

FEASIBILITY STUDY
Mine and Mill Waste Operable Unit

FIGURE 1 –1
JASPER COUNTY SITE MAP

PROJECT: 010022.4	
DATE: APR 11, 2003	
REV: 0	
BY: MCP	
CHECKED:	

Table 1 Summary of Estimated Quantities of Source Materials and Affected Media

Designated Area	Units	Belleville	Carl Junction	Iron Gates	Iron Gates Extension	Joplin	Klondike	Neck/Alba	Oronogo-Duenweg	Snap	Thoms	Waco	Total
Source Material Categories													
In/Near Stream Barren Chat	Cu.Yds.	95,699	4,645				1,703	21,209	287,063				410,319 Cu.Yds.
	Acres	14.8	2.9				0.5	8.2	186.9				213.3 Acres
In/Near Stream Vegetated Chat	Cu.Yds.		8,574					30,302	114,035		467		153,378 Cu.Yds.
	Acres		5.3					36.6	141.4		0.6		183.9 Acres
In/Near Stream Tailings	Cu.Yds.							31,222	28,322				59,544 Cu.Yds.
	Acres							20.5	21.8				42 Acres
Barren Chat Sediment Sources	Cu.Yds.	158,885			506,526	133,411	15,552		919,915		2,491	3,662	1,740,442 Cu.Yds.
	Acres	28.8			78.5	100.8	2.4		438.9		3.1	2.3	655 Acres
Vegetated Chat Sediment Sources	Cu.Yds.					33,634		6,068	34,193			26,103	99,998 Cu.Yds.
	Acres					51.0		5.2	42.5			21.3	120 Acres
Tailings Sediment Sources	Cu.Yds.					5,554.00			60,821.00	19,872	3,651		89,898 Cu.Yds.
	Acres					5.2			48.4	8.2	2.3		64 Acres
Upland Barren Chat	Cu.Yds.	189,831	75,123		88,583	384,719	1,775	181,949	1,247,783	8,103	4,675	5,585	2,168,326 Cu.Yds.
	Acres	30.0	24.0		10.6	153.1	0.3	59.9	894.8	1.8	1.9	4.6	1,181 Acres
Upland Vegetated Chat	Cu.Yds.		20,212			142,366		46,148	268,053	6456	18,144	124,305	625,684 Cu.Yds.
	Acres		7.7			163.9		51.5	297.1	8	16.6	72.9	617.7 Acres
Upland Tailings	Cu.Yds.		28,217			24,031		12,244	42,593	44,008	22,315	1,465	174,873 Cu.Yds.
	Acres		9.2			13.5		13.4	91.8	23.1	5.5	1.0	157.5 Acres
Acidic Overburden	Cu.Yds.										335,661		335,661 Cu.Yds.
	Acres										39.0		39.0 Acres
Sediment Categories													
Stream Sediments	Cu.Yds.	3,703			2,135	702	448		1,912				8,900 Cu.Yds.
	Lin. Ft.	2,500			4,239	2,310	2,420		8,990				20,459 Lin. Ft.
Soil Categories													
In/Near Stream Transition Zone Soil	Cu.Yds.	128,744	6,615	-	159,075	96,961	16,133	8,228	350,093	-	13,713	13,552	793,115 Cu.Yds.
	Acres	79.8	4.1		98.6	60.1	10.0	5.1	217.0		8.5	8.4	491.6 Acres
Upland Transition Zone Soils	Cu.Yds.	97,123	104,705	8,067	21,619	275,719	1,613	74,052	526,592	-	26,620	20,328	1,156,437 Cu.Yds.
	Acres	60.20	64.90	5.00	13.40	170.90	1.00	45.90	326.40		16.50	12.60	716.8 Acres

Total	Cu.Yds.	Acres
Total Barren Chat	4,319,087	2,049
Total Vegetated Chat	879,060	922
Total Tailings	324,315	264
Total Sediments	8,900	-
Total Mill Wastes	5,531,362	3,235
Total Mill Wastes	5,531,362	3,235
Total Transition Zone Soils	1,949,552	1,208
Total Overburden	335,661	39.0
Total	7,816,575	4,482

Table 2 Comparative Analysis of Remedial Alternatives with Respect to Overall Protection of Human Health and the Environment Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal, On-Site Aboveground Disposal, and Water Treatment
How the Alternative Enhances Human Health Protection	Alternative 1 does not enhance human health protection measures already being implemented under OU-2, OU-3 and OU-4. Alternative 1 relies more on institutional controls to manage residual human health risks than any other alternative.	Alternative 2 enhances the human health protections being implemented under OU-2, 3, and 4, by removing more than 75% of the mill waste through recycling. However, direct revegetation of mill wastes is the least protective containment option of any action alternative. Alternative 2 requires an estimated 30 years to achieve the predicted enhancements of human health protections.	Alternative 3 enhances the human health protections already being implemented by capping mill wasted with soil covers. These covers would be protective of human health. However, this alternative results in the largest land area occupied by mill wastes and subject to institutional controls of any of the action alternatives. Alternative 3 requires an estimated 12 years to achieve the predicted enhancements of human health protections.	The disposal and capping method prescribed under Alternative 4 would be fully protective of human health. Only 710 acres would be subject to institutional controls needed for long-term protection of remedial facilities. Alternative 4 requires an estimated 7 years to achieve the predicted enhancements of human health protections.	The disposal and capping method prescribed under Alternative 5a would be fully protective of human health. However, more mill waste remains on the land surface than any other alternative, except 5b. Approximately 1080 acres would be subject to institutional controls needed for long-term protection of remedial facilities. Alternative 5a requires an estimated 7 years to achieve the predicted enhancements of human health protections.	The disposal and capping method prescribed under Alternative 5b would be fully protective of human health. However, more mill waste remains on the land surface than any other alternative. Approximately 280 acres would be subject to Institutional controls needed for long-term protection of remedial facilities. The level of enhancements of human health protections is achieved in the shortest timeframe, 5 years.
How the Alternative Provides Environmental Protection	Source materials RAOs are not met because large areas remain affected by mill wastes exceeding the RBCs. Risks to terrestrial vermivores may actually	Source materials exceeding RBCs remain on Site under Alternative 2. The source material RAO may not be fully met if biosolids applications prove ineffective in	The source material RAO is expected to be met under Alternative 3. Alternative 3 would probably not be capable of achieving the 90-95%	Source material RAOs are met under Alternative 4, the same as Alternatives 3, 5a, and 5b. Surface water RAOs and	The source material and surface water RAOs are met under all conditions, the same as under Alternatives 3, 4, and 5b. Residual risks to terrestrial vermivores and	The source material, surface water, and groundwater RAOs are met under all conditions, the same as under Alternatives 3, 4 and 5a.

Table 2 Comparative Analysis of Remedial Alternatives with Respect to Overall Protection of Human Health and the Environment Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Re cycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal, On-Site Aboveground Disposal, and Water Treatment
	increase as more excavated barren chat areas become vegetated. Alternative 1 would not be capable of achieving the metal loading reductions needed to meet the surface water RAOs. No measures are taken to address the groundwater RAO. However, under all alternatives, the groundwater RAO may be met under current conditions despite the absence of remedial measures.	reducing metals bioavailability. Residual risks to vermivores are higher than other action alternatives. Alternative 2 would probably not be capable of achieving the 90-95% metal loading reductions needed to meet the surface water RAOs in all Class P streams and tributaries under all flow conditions. Direct revegetation of mill wastes using biosolids is expected to be the least adequate, permanent or reliable of any of the prescribed containment options. However, chat recycling is considered highly permanent and reliable and meets the objectives of treatment	metal loading reductions needed to meet the surface water RAOs in all Class P streams under all flow conditions. Simple soil covers are considered more permanent than direct revegetation, but less adequate or reliable than subsidence pit disposal or the engineered repositories prescribed under Alternatives 4, 5a, or 5b. The groundwater RAO is achieved, the same as all other alternatives. The same groundwater actions are prescribed as Alternatives 2, 4, and 5a. Alternative 3 requires 12 years to attain the predicted level of RAOs achievement.	ARARs are expected to be consistently achieved. Residual risks to aquatic life are lower than Alternatives 1, 2, or 3. Subsidence pit disposal is expected to be the most permanent and reliable disposal option of any prescribed. The groundwater RAO is achieved, the same as all other alternatives. RAOs are expected to be met under Alternative 4 in approximately 7 years.	aquatic life are lower than Alternatives 1, 2, or 3 but the same as Alternatives 4 and 5b. The groundwater RAO is achieved, the same as all other action alternatives. The engineered repositories prescribed under Alternative 5a are adequate and reliable, but are considered somewhat less permanent than subsidence pit disposal. RAOs are expected to be met under Alternative 5a in approximately 7 years.	The engineered repositories prescribed under Alternative 5b are adequate and reliable, but are considered somewhat less permanent than subsidence pit disposal. RAOs are expected to be met under Alternative 5b in approximately 5 years.

Table 2 Comparative Analysis of Remedial Alternatives with Respect to Overall Protection of Human Health and the Environment Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal, On-Site Aboveground Disposal, and Water Treatment
How the Alternative Provides Environmental Protection (continued)		Although the groundwater RAO may be met under current conditions, shaft plugs and diversion ditches are implemented to further reduce groundwater loadings to surface water. Alternative 2 requires 30 years to attain the predicted level of RAOs achievement.				

Table 3 Comparative Analysis of Remedial Alternatives with Respect to Compliance with ARARs
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal, On-Site Aboveground Disposal, and Water Treatment
Compliance with Chemical-Specific ARARs	Under Alternative 1, exceedances of chemical-specific ARARs are expected to occur in Class P stream and regularly in some tributaries and miner's ditches during high flow conditions.	Alternative 2 would probably not be capable of achieving the 90-95% metal loading reductions needed to meet Federal chronic ALCs in all Class P streams under all flow conditions and would likely not meet ALCs in the tributaries or miner's ditches.	Same as Alternative 2.	Federal chronic ALCs are met in their respective Class P streams under all flow conditions.	Same as Alternative 4.	Same as Alternatives 4 and 5a.
Compliance with Action-Specific ARARs	Uncontrolled chat recycling does not comply with applicable storm water regulations that are identified as action-specific ARARs for this alternative. No other action-specific ARARs are identified for Alternative 1.	Potential action-specific ARARs identified under Alternative 2 include: Storm water regulations for chat recycling, requirements of 40 CFR Part 503 for biosolids applications, Federal and State NPDES storm water requirements, and the dredge and fill requirements of Section 404 of the CWA for excavating mill wastes and sediments from stream channels, and the NAAQS under the CAA.	Same as Alternative 2.	Dredge and fill requirements of Section 404 of the CWA, requirements of 40 CFR Part 503 for biosolids applications, Federal and State NPDES storm water requirements, and the NAAQS under the CAA are the only potential action-specific ARARs identified for Alternative 4. The Federal and State UIC regulations do not apply if only pits wider than they are deep are used for disposal sites.	Dredge and fill requirements of Section 404 of the CWA, requirements of 40 CFR Part 503 for biosolids applications, Federal and State NPDES storm water requirements, and the NAAQS under the CAA are the only potential action-specific ARARs identified for Alternatives 5a. Alternative 5a would comply with the potential action-specific ARARs identified for this alternative.	Same as Alternative 5a with the exception of the need for the requirements of 40 CFR Part 503 for biosolids applications.

Table 3 Comparative Analysis of Remedial Alternatives with Respect to Compliance with ARARs
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegetation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal, On-Site Aboveground Disposal, and Water Treatment
		Alternative 2 would comply with these potential action-specific ARARs.		Alternative 4 would comply with the potential action-specific ARARs identified for this alternative.		
Compliance with Location-Specific ARARs	Alternative 1 complies with location specific ARARs.	Alternative 2 complies with location specific ARARs.	Same as Alternative 2.	Actions proposed under Alternative 4 comply with location-specific ARARs provided pits containing aquatic habitat are not used as disposal sites to assure compliance with habitat and wetland protection requirements.	Alternative 5a complies with location specific ARARs.	Same as Alternative 5a.
Compliance with Other Criteria, Advisories, and Guidance (TBCs)	Chat recycling may not always comply with guidance on appropriate chat uses to prevent risks to human health contained in EPA Region VII's Mine Waste Fact Sheet.	In contrast to Alternative 1, the controlled chat recycling prescribed under Alternative 2 is more likely to comply with EPA's guidance on appropriate chat uses to prevent risks to human health.	Same as Alternative 2.	The RCRA CAMU rule and the state and federal UIC regulations are ARARs if the pits meet the definition of a well or hazardous wastes or contaminated liquids are disposed. Otherwise, the UIC is a TBC. Alternative 4 would comply with the pertinent substantive guidance provided by these TBCs.	The RCRA CAMU rule is an action-specific TBCs for this alternative. Alternative 5a would comply with the pertinent substantive guidance provided by this TBC.	Same as Alternative 5a.

Table 4 Federal and State Chemical-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
AIR				
FEDERAL REQUIREMENTS				
Clean Air Act – National Primary and Secondary Ambient Air Quality Standards	42 USC Secs. 7401 – 7671 40 CFR Part 50	The Clean Air Act and implementing regulations define air quality criteria for protecting human health, including standards for particulate matter and lead.	X	
STATE REQUIREMENTS				
Missouri Air Conservation Law	RSMo 643 10 CSR 10	Set ambient air quality standards for a variety of constituents, including particulate matter and lead.	X	
GROUNDWATER				
FEDERAL REQUIREMENTS				
Federal Safe Drinking Water Act – National Primary and Secondary Standards	40 CFR Parts 141 and 143	Establishes primary maximum contaminant levels (MCLs) and MCL goals (MCLGs) that are health-based standards for public drinking water systems, as well as secondary MCLs and MCLGs that are standards for constituents that affect only the aesthetic qualities of drinking water. According to the NCP, MCLs and MCLGs are ARARs for groundwater at Superfund sites.	X	
Technical Impracticability Waiver for Groundwater ARARs – Jasper County Site	Region VII EPA Record of Decision for the Groundwater Operable Unit (OU-4) of the Jasper County, Missouri Superfund Site, July 29, 1998.	This document established the technical impracticability (TI) of restoring the shallow groundwater aquifer in mined areas of the Jasper County site. The TI waiver determined that aquifer restoration was impracticable based on the large size and heterogeneous nature of the aquifer, lack of effective pumping and treatment technology, and the inordinate costs associated with groundwater treatment.		X
STATE REQUIREMENTS				
Missouri Safe Drinking Water Act	RSMo 640.100 – 140 10 CSR 60	Contains MCLs and monitoring requirements for drinking water supplies.	X	

Table 4 Federal and State Chemical-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
SOURCE MATERIALS AND SOILS				
FEDERAL REQUIREMENTS				
Risk Management Considerations for Terrestrial Vermivores	NewFields and Black & Veatch 2001	Establishes site specific criteria for preventing risks to terrestrial vermivores. Source materials and soil criteria for vermivores include cadmium: 41 mg/kg; lead: 804 mg/kg; and zinc: 6,424 mg/kg. These criteria are not legal or regulatory standards but should be considered during alternative evaluation.		X
Baseline Ecological Risk Assessment for the Jasper County Superfund Site, Jasper County, Missouri.	Black and Veatch 1998	The BERA provides a screening level evaluation of potential risks to ecological receptors in the Site. The BERA identified the potential exposure pathways addressed in the Risk Management Considerations document cited above.		X
Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.	OSWER Directive No. 9355.4-12, July 14, 1994	Recommends a screening level of 400 ppm for lead in residential soils. Describes methodology for developing site-specific preliminary remediation goals. Describes a plan for soil lead cleanup at sites with multiple sources of lead. This directive provides guidance for evaluating the extent to which proposed remedial actions might enhance protection of human health.		X
Soil Screening Guidance	OSWER Directive 9355.4-23, July 1996 EPA/540/R-961108 and 128	Recommends the development of site-specific soil screening levels. Provides general screening levels below which areas are determined to be adequate and do not need further assessment. Further evaluation of risks is recommended for areas above the screening levels.		X
STATE REQUIREMENTS				
Cleanup Levels for Missouri (CALM) Guidance	Missouri Department of Natural Resources' Cleanup Levels for Missouri Guidance, September 2001	The Cleanup Levels for Missouri (CALM) guidance document outlines a process for determining cleanup goals at sites with known or suspected hazardous substance contamination. MDNR and the Missouri Department of Health and Senior Services established CALM as a risk-based approach that takes into account land use (industrial, commercial, and unrestricted/residential), with three key tables listing soil and groundwater cleanup standards. These are not ARARs but may be TBCs.		X

Table 4 Federal and State Chemical-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	I ARARs	To Be Considered
SURFACE WATER				
FEDERAL REQUIREMENTS				
Clean Water Act – Water Quality Standards, Chronic Aquatic Life Criteria	40 CFR Sec. 131	Although the Federal chronic ALCs are not applicable, they are relevant and appropriate requirements for the perennial (Class P) streams and their tributaries for this Site because they are more stringent than the Missouri Water Quality Standards (WQS). The Federal ALCs for the COCs are based on the site-specific hardness of the surface water body. Therefore, the ALCs vary from stream to stream according to the hardness. Table 3-1 in the FS summarizes the Federal chronic ALCs for specific Class P streams within the Site. Tributaries to Class P streams would have hardness values determined during remedial design work.	X	
STATE REQUIREMENTS				
Missouri Clean Water Law– Water Quality Standards	RSMo 644.006 – 564 10 CSR 20-7.031	The Federal chronic ALCs are more stringent than the WQS established by Missouri under this law. Missouri is currently revising its WQS for streams and tributaries located within the Site. In the event that Missouri's new WQS are approved by EPA and no longer less stringent than the Federal ALCs, the WQS may become ARARs for the Site if they are adopted prior to ROD issuance. In assessing the remedy at the five-year reviews, the EPA will consider new information, such as new State WQS or site-specific standards in determining the protectiveness of the remedy.	X	
Missouri Clean Water Law– TMDL Regulations	Pending	Under this program, the State designates beneficial uses for waters of the state and to takes steps to determine if the uses are attainable and what the total maximum daily loads (TMDLs) should be to protect the designated uses. The TMDLs would be applicable to point discharges from abandoned mined lands, as well as active chat quarrying operations. The state TMDLs are currently not ARARs. However, Missouri and EPA are currently gathering supporting information for future implementation of a state TMDL program, and the TMDLs promulgated under this program could become ARARs when this program is formally implemented.		X

Table 4 Federal and State Chemical-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
SEDIMENT				
Probable Effect Concentrations	McDonald *et al.*, 2000	Probable effect concentrations (PECs) are screening level concentrations of metals in fresh water sediments above which adverse effects may be expected to occur. PECs identified by McDonald *et al.* (2000) include 4.98 mg/kg for Cd; 128 mg/kg for Pb; and 459 mg/kg for Zn. However, these PECs are TBCs, as there are no applicable or relevant and appropriate criteria for sediments.		X
Equilibrium-Partitioning Sediment Guidelines (ESGs)	EPA Draft November 10, 1999 "Draft Metal Mixtures ESG Document"	Equilibrium-Partitioning Sediment Guidelines (ESGs) are EPA's best estimate of the concentration of the mixture of cadmium, copper, lead, nickel, silver and/or zinc that is protective of the presence of benthic organisms.		X

Table 5 Federal and State Chemical-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
FEDERAL ARARs				
National Ambient Air Quality Standards (NAAQS)	42 USC Sec. 7401 *et seq.* 40 CFR Part 250	These regulations establish ambient air quality standards for emissions of lead and particulate matter. Remedial actions taken under any of the alternatives (except no action) are likely to result in release of airborne lead and dust. These regulations are applicable to "major sources" as defined under the Clean Air Act Although remediation sites in Jasper County are not expected to be major sources, these regulations would be relevant and appropriate for the remedial activities at the Site.	X	
Resource Conservation and Recovery Act (RCRA), Subtitle D, Solid Waste Regulations	42 USC Sec. 6941 40 CFR Part 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices	This section of the RCRA regulations requires the closure of existing solid waste facilities, design of new landfills, and disposal of solid wastes to be in accordance with various standards and criteria. These standards are *applicable to solid waste disposal facilities, including mining and mill waste* facilities. Among other things, these regulations require that facilities be maintained to prevent wash out of solid wastes and that the public not be allowed uncontrolled access.	X	
RCRA, Subtitle C, Identification and Listing of Hazardous Wastes	RCRA Section 3001(b)(3)(A)(iii), Beville exclusion of mineral extraction and beneficiation wastes. 40 CFR Part 264.2, Definition of solid waste and 40 CFR Part 261.4 (b) (7)	Mill waste within the Site is specifically excluded from regulation as hazardous wastes under the Beville exclusion because they are wastes resulting from mineral extraction and beneficiation. Therefore, the RCRA Subtitle C regulations are not ARARs.	X	
RCRA, Subtitle C, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	RCRA Section 3001 *et seq.* 42 USC Sec. 6921, *et seq.* 40 CFR Part 264.522, Disposal Of Hazardous Wastes In Designated Corrective Action Management Units (CAMUs). 40 CFS Part 264.554(D)(1)(i) and (ii) Staging Piles	The section defines Corrective Action Management Units (CAMUs) to be used in implementing corrective actions at Superfund Sites. A CAMU is defined as a disposal site used for consolidation or placement of remediation wastes within the contaminated areas of the site. Under these regulations, placement of wastes in a CAMU does not constitute land disposal of hazardous waste and does not constitute creation of a unit subject to the RCRA land disposal restrictions and minimum technology requirements (40 CFR Part 268). This Section of RCRA is not an ARAR because of the Beville exclusion, but certain substantive requirements related to design, operation and closure of disposal sites should be considered.		X

Table 5 Federal and State Chemical-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
Toxic Substances Control Act – Strategy for Reducing Lead Exposures	EPA, February 21, 1991	Presents strategies for reducing the amount of lead in the environment, as well as reducing blood lead levels, especially in children.		X
Surface Mining Control and Reclamation Act (SMCRA)	30 USC Secs. 1201-1328 30 CFR Part 816	SMCRA regulations govern coal exploration and active coal mining. Hence, these regulations are not applicable to remedial actions taken under OU-1 of the Jasper County Site. Nevertheless, some of the surface mining standards found in 30 CFR Part 816 should be considered because they address Circumstances similar to those at the Jasper County Site. Part 816 provides requirements for sediment control, grading requirements; and revegetation.		X
DOT Hazardous Materials Transportation Regulations	49 CFR Parts 107,171-177	Regulates transportation of hazardous materials. Would be relevant and appropriate for the transport of excavated materials within the site.	X	
Clean Water Act- Dredge or Fill Requirements (Section 404)	33 USC Secs. 1251-1376 40 CFR Parts 230, 231	Regulates discharge of dredged or fill material into navigable waters.	X	
Clean Water Act- Effluent Discharge Standards	40 CFR Sec.125.100 40 CFR Sec. 122.41	Requires that best management practices be maintained by the operator of a facility that discharges pollutants directly into the environment and requires that point source discharges be monitored to assure compliance with effluent discharge limits.	X	
Clean Water Act - Discharge of Storm Water	40 CFR Sec. 122.21 40 CFR Sec. 122.26	Regulates point and non-point storm water discharges associated with industrial activity and construction activities; includes requirements for best management practices and for pollution prevention plans. Industrial activity includes active and inactive mining areas.	X	
Safe Drinking Water Act – Underground Injection Control Program	42 USC Secs. 300f – 300j 40 CFR Part 144 – 148	Regulates disposal of wastes in underground injection wells to ensure protection of drinking water sources.	X	
Federal Sewage Sludge Management Program – Land Application Regulations	40 CFR, Chapter I, Subchapter O, Part 503	This subpart contains the applicable requirements for persons who prepare sewage sludge for land application and who applies sludge to land. These regulations include performance standards for pathogen reduction and criteria for metals concentrations in the sludge and soils where the sludge is applied as a means of protecting human health. Rules for applying sludge near surface water bodies are also included to prevent pollution of streams, rivers, and lakes.	X	

Table 5 Federal and State Chemical-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
EPA Mine Waste	EPA Region 7 Fact Sheet, February 2003	Provides public guidance on mine waste usage in the states of Missouri and Kansas. Provides a list of uses for mine waste what is not likely to present a threat to human health or the environment.		X
EPA's EE/CA for Removal Actions for the Highway 249 Project	EPA, 2000a	Provides site-specific guidance for excavation and disposal of mill wastes, including guidance on identification of ARARs.		X
STATE REQUIREMENTS			X	
Missouri Fugitive Particulate Matter Regulations	10 CSR 10-6.170	The Missouri fugitive particulate matter regulations contain restrictions on the release of particulate matter to ambient air. These regulations are applicable to any dust emissions that occur as a result of remedial actions taken at the site.	X	
Missouri Clean Water Law– Effluent Regulations	RSMo 644.006 – 564 10 CSR 20-7.015	Regulates the discharge of constituents from any point source, including storm water, into waters of the state. Provides for maintenance and protection of public health and aquatic life uses of surface water and groundwater. State permits would not be required under CERCLA, but the substantive provisions would be applicable.	X	
Missouri Clean Water Law– Construction and Operating Permits	10 CSR 20-6.010	Requires permits for discharges from point sources of water contamination. Although permits are not required for remedial actions conducted under CERCLA, these regulations may be relevant and appropriate to corrective actions taken at the site.	X	
Missouri Clean Water Law– Storm Water Regulations	10 CSR 20-6.200	Requires permits for metal and non-metal mining facilities and land uses or disturbances that create point source discharges of storm water. These regulations define Best Management Practices for land disturbances, including practices or procedures that would reduce the amount of metals in soils and sediments available for transport to waters of the state. Permits would not be required for actions taken under CERCLA, but the substantive provisions of these regulations would be applicable.	X	
Missouri Clean Water Law– TMDL Regulations	MOU between EPA and MDNR regarding the state's implementation of Section 303(d) of the federal Clean Water Act and 10 CSR 20-7	Requires the state to designate beneficial uses for waters of the state and to takes steps to determine if the uses are attainable and what the total maximum daily loads (TMDLs) should be to protect the designated uses. The TMDLs would be applicable to point discharges from abandoned mined lands, as well as active chat quarrying operations.	X	

Table 5 Federal and State Chemical-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
Missouri Clean Water Law– Underground Injection Control Program	Class I: RSMo 577.155 Class III: 10 CSR 20.6.090	Class I wells used to inject hazardous wastes or dispose of industrial and municipal fluids beneath the lowest underground source of drinking water are banned in Missouri by RSMo 577.155. Class III wells are used to inject fluids to extract minerals and are regulated under 10 CSR 20-6.090 and permitted under the authority of RSMo 644. The UIC regulations would be ARARs if disposal sites meet the definition of a well.	X	
Missouri Well Drillers' Law	RSMo 256.600 – 640 10 CSR 23	Sets fees and standards to be followed in installing, maintaining, and abandoning water wells and monitoring wells. Covers well plugging and proper isolation of possible sources of contamination from existing wells.	X	
Missouri Solid Waste Disposal Law	RSMo 260.200 – 345 10 CSR 80	Regulates facilities used for the disposal nonhazardous industrial, commercial, agricultural, infections, and domestic wastes. Does not apply to the disposal of overburden, rock, tailings, matte, slag, or other waste material resulting from mining, milling, or smelting. However, the regulations are considered relevant and appropriate.	X	
Missouri Hazardous Waste Management Law	RSMo 260.350 – 434 10 CSR 25	Regulates the generation, identification, treatment and disposal of hazardous wastes. These regulations are not applicable, relevant or appropriate to mining and beneficiation wastes. However, certain requirements related to design, operation and closure of disposal sites should be considered.		X
Missouri Metallic Minerals Waste Management Act	RSMo 444.350 – 380 10CSR 45	Regulates disposal of waste from active metallic mineral mining, beneficiation, and processing. The regulations also contain technical guidelines, permitting, and closure requirements. Because these regulations contain closure standards for active metal mines, they are not ARARs but may be reviewed and considered during the design of removal actions. They are considered TBCs.		X
Missouri Land Reclamation Act - Industrial Mineral Law	RSMo 444.760 – 790 10 CSR 40.010	This law and regulations contain permitting and performance requirements for non-metal mining, surface and underground coal mining, in-stream sand and gravel, industrial mineral open pit mining, limestone, clay, etc. However, the law and implementing regulations are not applicable to chat recycling operations because chat piles are not natural formations. However, some of the surface mining standards are relevant and appropriate requirements because they address circumstances that are similar to those at chat recycling and quarrying operations in the Jasper County Site.	X	

Table 5 Federal and State Chemical-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARARs	To Be Considered
Missouri Clean Water Act – Chapter 8 – Design Guides – Regulations on Handling and Disposal of Municipal Sewage Sludge, Land Application	10 CSR 20-8.170, Section (9) Municipal Sludge Disposal on Land	These regulations contain Missouri's guidelines and requirements for disposing of municipal sewage sludge on land. The State's guidelines and requirements are less stringent and less comprehensive than the Federal regulations cited above (40 CFR Part 503) and are, therefore, likely not applicable. However, these regulations are considered relevant and appropriate requirements.	X	

Table 6 Federal and State, and Local Location-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARAR	To Be Considered
FEDERAL REQUIREMENTS				
Archaeological and Historic Preservation Act	16 USC Sec. 469 40 CFR Sec. 6.301(c)	Establishes procedures to provide for preservation of historical and archaeological data which might be destroyed through alteration of terrain as a result of a Federally licensed activity or program.	X	
Archaeological Resources Protection Act	16 USC Secs. 470 aa - mm	Requires permits for any excavation or removal of archaeological resources from public or Indian lands. Provides guidance for Federal land managers to protect such resources.		X
National Historic Preservation Act	16 USC Sec. 470 40 CFR Sec. 6.301(b) 36 CFR Part 800 Executive Order 11593, May 3, 1971	Requires Federal agencies to take into account the effect of any Federally assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for Register of Historic Places.	X	
Historic Sites, Buildings, and Antiquities Act	16 USC Secs. 461-467 40 CFR Sec. 6.301(a)	Requires Federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts on such landmarks.	X	
Fish and Wildlife Coordination Act	16 USC Secs. 661-666 40 CFR Sec. 6.302(g)	Requires any Federal agency or permitted entity to consult with the U.S. Fish and Wildlife Service and appropriate state agency prior to modification of any stream or other water body. The intent of this requirement is to conserve, improve, or prevent loss of wildlife habitat and resources.	X	
Fish and Wildlife Conservation Act	16 USC Secs. 2901- 2912	Requires Federal agencies to utilize their statutory and administrative authority to conserve and promote conservation of non-game fish and wildlife species.		X
Endangered Species Act	16 USC Secs. 1531-1544 50 CFR Parts 17, 402 40 CFR Sec. 6.302(h)	Requires that Federal agencies insure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat.	X	
Federal Migratory Bird Act	16 USC Secs. 703 - 712	Requires remedial actions to conserve habitat and consultation with the Department of Interior if any critical habitat is affected.	X	
Executive Order on Floodplain Management	Executive Order No. 11988 40 CFR Sec. 6.302(b) and Appendix A	Requires Federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the maximum extent possible, the adverse impacts associated with direct and indirect development of a floodplain.		X
Executive Order on Protection of Wetlands	Executive Order No. 11990 40 CFR Sec. 6.302(a) and Appendix A	Requires Federal agencies to avoid, to the maximum extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid new construction in wetlands, if a practicable alternative exists.		X

Table 6 Federal and State, and Local Location-Specific ARARs and Guidance to be Considered

Standard, Requirement, Criteria, or Limitation	Citation	Description	ARAR	To Be Considered
Farmland Protection Policy Act	7 USC Sec. 4201 *et. seq.* 40 CFR Sec. 6.302 (c)	Protects significant or important agricultural lands from irreversible conversion to uses that result in its loss as an environmental or essential food production resource.		X
RCRA – Location Standards for Hazardous Waste Facilities	42 USC Sec. 6901 40 CFR 264.18	Requires that any hazardous waste facility located within the 100-year floodplain be designed, constructed, operated, and maintained to avoid washout. Also, contains requirements for locating facilities away from seismically active zones.		X
Rivers and Harbors Act	33 CFR Secs. 320 - 330	Requires preapproval of the US Army Corps of Engineers prior to placement of any structures in waterways and restricts the placement of structures in waterways.		X
STATE REQUIREMENTS				
Missouri Wildlife Code	3 CSR Sec.10 – 4.111	Requires a determination of the presence or absence of endangered or threatened species, and provides for regulation of non-game wildlife. Places restrictions on actions affecting protected species.	X	

Table 7 Comparative Analysis of Remedial Alternatives with Respect to Long-Term Effectiveness and Permanence
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Magnitude of Residual Risks	Approximately 5,000 acres of land require institutional controls to manage residual human health risks. Residual risks to vermivores are highest under Alternative 1 because large areas of mill waste exceed RBCs. The source material RAO is not achieved. In fact, risks to vermivores may increase over time as more excavated barren chat areas becomes vegetated. Residual risks to aquatic life are highest under Alternative 1 because surface water ARARs are exceeded and the RAOs are not achieved. Residual seepage from mill wastes is highest with a predicted annual site-wide seepage of 240 million CF/year.	At full implementation under Alternative 2, approximately 1,139 acres of land require institutional controls. At full implementation, approximately 180 acres of tailings exceed RBCs. Hence, the source material RAO may not be met, as residual risks to terrestrial vermivores still exist. In fact, risks may be increased in some revegetated source materials compared to other alternatives, if biosolids prove ineffective in reducing metals bioavailability. Surface water RAOs are not fully achieved, as ARARs continue to be exceeded under some conditions posing residual risks to aquatic life. Compared to current conditions (Alternative 1), residual mill waste seepage is reduced by 84% to 39 million CF/year. Full implementation under Alternative 2 requires up to 30 years.	Under Alternative 3, approximately 1,700 acres of land require institutional controls to manage residual human health risks at full implementation. In contrast to Alternatives 1 and 2, the source. material RAO is achieved under Alternative 3 because potential exposure pathways are addressed. Surface water RAOs are not fully achieved, as ARARs continue to be exceeded under some conditions posing residual risks to aquatic life. Compared to current conditions (Alternative 1), residual mill waste seepage is reduced by 80% to 48 million CF/year. Full implementation of Alternative 3 requires up to 12 years.	At full implementation, only 710 acres are subject to institutional controls to manage residual human health risks. Source material and surface water RAOs are fully achieved. Residual risks to terrestrial vermivores and aquatic life are negligible. Compared to current conditions (Alternative 1), residual millwaste seepage is reduced by 90% to 24 million CF/year. Full implementation of Alternative 4 can be achieved in 7 years.	Approximately 1,080 acres are subject to institutional controls to manage residual human health risks at full implementation under Alternative 5a. Source material and surface water RAOs are fully achieved. Residual risks to terrestrial vermivores and aquatic life are negligible. Compared to current conditions (Alternative 1), residual mill waste seepage is reduced by 90% to 24 million CF/year. Full implementation of Alternative 5a can be achieved in 7 years.	Only 280 acres are subject to institutional controls to manage residual human health risks at full implementation under Alternative 5b, the lowest of any alternative. Source material and surface water RAOs are fully achieved. Residual risks to terrestrial vermivores and aquatic life are negligible. Residual mill waste seepage is practically eliminated under Alternative 5b. Full implementation of Alternative 5b can be achieved In 5 years.

Table 7 Comparative Analysis of Remedial Alternatives with Respect to Long-Term Effectiveness and Permanence
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Adequacy and Reliability of Controls	The extent of environmental risk management under Alternative 1 is inadequate for achieving the RAOs. Alternative 1 affords no enhancement of existing institutional controls implemented under other OUs for the protection of human health. No long-term management or maintenance is required under Alternative 1, but monitoring continues indefinitely.	Infiltration and seepage from mill wastes directly revegetated using biosolids is higher under this alternative than the options prescribed under any other action alternatives. Direct revegetation, as prescribed under Alt. 2 is considered the least permanent cover option of any alternatives. However, chat recycling is considered highly permanent and reliable for reducing the volume of source materials remaining on Site. The adequacy and reliability of the treatment effect of biosolids in reducing bioavailability to terrestrial vermivores is uncertain. However, deep tilling of vegetated chat and transition zone soils is considered adequate for reducing metal concentrations below RBCs, thereby reducing risks to vermivores. Under Alternative 2, interim management of consolidated waste piles may be required up to 30 years	Less infiltration and seepage results from the waste piles capped with simple soil covers under Alt. 3 than the directly revegetated piles under Alt. 2. However, simple soil covers are les s effective at preventing infiltration than the geo-composite cover systems prescribed under Alt. 4, 5a, and 5b. Simple soil covers are considered a more permanent, and reliable than Alt. 1 and 2, but less permanent and reliable than subsidence pit disposal or the engineered repositories prescribed under Alt 4, 5a and 5b. Under Alternative 3, interim management of consolidated waste piles is required up to 10 years. No long-term maintenance of capped waste piles, except institutional controls, is required at full implementation.	The geo-composite cover system installed on the filled subsidence pits is the most effective cover option, as it nearly eliminates surface infiltration into the disposed mill wastes. However, the cover system would require maintenance. Subsidence pit disposal, as prescribed under Alternative 4 is considered the most permanent and reliable method available for the long-term management of mill wastes. Long-term management of the capped subsidence pits consists of restricting future land uses an estimated 710 acres.	The geo-composite cover systems nearly eliminate surface infiltration and seepage but would require maintenance, the same as Alternatives 4 and 5b. Since the repositories are aboveground, they are considered somewhat less permanent than subsidence pit disposal. Long-term management of the aboveground repositories consists of restricting future land uses an estimated 1,080 acres.	Same as Alternative 5a. However, maintenance of the repository cover systems is limited to 280 acres. The passive anaerobic treatment systems prescribed under this alternative are innovative and their long-term reliability is not fully tested. Also, the requirements for long-term monitoring and possible replacement of the organic substrate in the anaerobic treatment systems are unique to this alternative.

Table 8 Comparative Analysis of Remedial Alternatives with Respect to Short-Term Effectiveness
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Protection of the Community During Remedial Actions	Risks to the community are the same as under current conditions.	Potential risks to the community under Alt. 2 are the same as under all other action alternatives. These potential risks are readily mitigated through appropriate traffic safety, dust control, and public involvement measures. Risks to local communities caused by biosolids applications may be negligible, if application complies with EPA regulations. However, public perception of risks may be high.	Same as Alternative 2.	A larger amount of source materials are hauled within DAs than under Alternatives 2 or 3. Truck traffic and dust generation are more intense for a short period (7 years). Potential risks to the local community will be higher during this period than under Alternatives 2 or 3.	Same as Alternative 4.	Same as Alternative 4. However, more materials are hauled longer distances outside the DAs than any other action alternative. Truck traffic and dust generation will be more intense for a short period (5 years). Potential risks to the local community will be higher during this period than under other alternatives.
Protection of Workers During Remedial Actions	No additional risks to workers are experienced under the no further action alternative.	Risks to workers are the same under Alternative 2 as under all other action alternatives, except Alternative 4. These risks can be reduced through appropriate worker health and safety training, design, and planning.	Same as Alternative 2.	Risks to workers are the same under other action alternatives. However, workers are exposed to increased risks due to the physical hazards of filling the subsidence pits. Additional measures to evaluate and mitigate these hazards will be needed that are unique to this alternative.	Same as Alternative 2.	Same as Alternative 2.

Table 8 Comparative Analysis of Remedial Alternatives with Respect to Short-Term Effectiveness
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Re vegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Potential Environmental Impacts Caused by the Remedial Actions	Risks to the environment are the same as under current conditions.	Potential environmental impacts caused by excavating mill wastes and sediments from riparian areas and wetlands are the same under this alternative as under all other alternatives. Excessive nutrient loading to surface waters is a potential impact unique to Alts. 2 and 3. This potential impact can be mitigated by composting, multiple applications, and avoiding applications near surface water bodies. Alt. 2 remediates an estimated 2,100 acres of land to usable condition by consolidating and recycling source materials.	Same as Alternative 2. Soil loss due to extensive construction of soil covers impacts the environment by depleting non-renewable soil resources. Alternative 3 results in the greatest amount of soil depletion (>2 million) CY than any other action alternative. Alternative 3 remediates an estimated 1,500 acres of land to usable condition by consolidating and recycling source materials.	A short-term release of metals to groundwater unique to Alt. 4 occurs when mill wastes are placed in subsidence pits. These metals releases localized, and have no affect on surface water quality or on groundwater quality distant from the mine workings. Aquatic habitat may be lost by placing wastes in subsidence pits. Habitat loss is minimized by selecting disposal sites with low value habitat. Loss of non-renewable soil resources is significantly less under this alternative than under Alt. 3, as the amount of borrow soil used is minimal by comparison. Alt. 4 remediates an estimated 2,500 acres of land to usable condition by disposing of source materials in pits.	More soil (>1 million CY) is used under this alternative than under Alternative 4. However, the loss of non-renewable soil resources is half that of Alternative 3. Alternative 5a remediates an estimated 1,500 acres land to usable condition by disposing of source materials in on-site repositories.	Same as Alternative 5a, but less borrow soil (670,000 CY) Is needed to implement Alternative 5b because of the greater level of repository centralization. Alternative 5b remediates the greatest amount (an estimated 3,000 acres) of land to usable condition than any other action alternative.

Table 8 Comparative Analysis of Remedial Alternatives with Respect to Short-Term Effectiveness
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Time Until RAOs Are Achieved	RAOs are not achieved under Alternative 1.	Initial response actions are completed within 5 years. Full implementation is achieved within 30 years. However, source material and surface water RAOs may not be fully achieved at full implementation.	Initial response actions are completed within 5 years. Full implementation is achieved within 12 years. However, surface water RAOs may not be fully achieved at full implementation.	All RAOs are achieved within 7 years of the start of remedial actions.	All RAOs are achieved within 7 years of the start of remedial actions.	All RAOs are achieved within 5 years of the start of remedial actions.

Table 9 Comparative Analysis of Remedial Alternatives with Respect to Reduction of Toxicity, Mobility, or Volume Through Treatment Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Treatment Process Used and Materials Treated	Chat recycling may result in treatment, but uncontrolled recycling and use of chat, as currently practiced, is not considered effective or reliable treatment.	Controlled chat recycling under Alternative 2 meets the objectives of treatment by incorporating chat into asphalt or concrete or by chat washing. Chat that is not treated is effectively contained by use as fill materials that prevent exposure or metals transports.	Same as Alternative 2 Alternative 3 does not rely on treatment to reduce mobility and bioavailability of in metals in vermivores, as in Alternative 2.	Subaqueous mill waste disposal results in remineralization of metal oxides as insoluble sulfides. This reduces the mobility of the metals.	On-site aboveground disposal would not result in TMV reductions through treatment.	All chat recycling is precluded under Alternative 5b. Treatment occurs in passive anaerobic treatment systems reducing metals mobility. No biosolids are used under Alternative 5b.
Amount of Materials Treated	None.	None.	None.	Approximately 3.8 million CY are treated by reducing conditions in the capped subsidence pits.	None.	Metal loads addressed by the passive anaerobic treatment systems are minor.
Effectiveness and Irreversibility of Treatment	None.	Reductions in TMV achieved by chat recycling are effective and irreversible. The irreversibility and long-term effectiveness of treatment effects from biosolids additions are currently being investigated.	Same as Alternative 2.	Reductive remineralization is highly effective in reducing metal mobility. However, insoluble sulfide minerals can be reoxidized if exposed to weathering conditions.	Same as Alternative 2.	Remineralization that occurs in passive anaerobic treatment systems is highly effective in reducing metal mobility. However, insoluble sulfide minerals can be re-oxidized if re-exposed to weathering conditions.

Table 9 Comparative Analysis of Remedial Alternatives with Respect to Reduction of Toxicity, Mobility, or Volume Through Treatment Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Treatment Residuals Generated	No treatment residuals are generated under Alternative 1.	No treatment residuals are generated under Alternative 2.	Same as Alternative 2.	No treatment residuals are generated under Alternative 4.	Same as Alternative 4.	Treatment residuals consist of spent organic substrate from the anaerobic treatment systems. The metals immobilized by the treatment process remain in the substrate. Hence, disposal as a hazardous waste may be required.

Table 10 Comparative Analysis of Remedial Alternatives with Respect to Implementability
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Technical Feasibility – Constructibility and Reliability of Prescribed Technologies	All the actions described under Alternative 1 are implementable.	Engineering controls prescribed under Alt. 2 technically feasible and readily constructible. Additional remedial measures are readily implementable, if needed, under Alt. 2.	Same as Alternative 2.	Same as Alternative 2. However, undertaking additional remedial measures would be extremely difficult, if not impossible under Alt. 4.	Same as Alternative 2.	Same as Alternative 2. The passive anaerobic treatment systems are constructible but innovative.
Administrative Feasibility	The greatest level of coordination among federal, state, or local agencies is required under Alt.1 because the most land area is subject to institutional controls. Alt.1 relies on institutional controls to manage residual risks. Institutional controls may preclude landowners from fully utilizing lands affected by mill wastes. Alternative 1 is the most restrictive in terms of limiting the flexibility of future land uses.	Administration of institutional controls requires less coordination compared with Alternative 1. Landowner access agreements and easements are expected to be facilitated under Alternative 2 by allowing continued chat recycling for a longer period of time than other alternatives. Alternative 2 allows greater flexibility of future land uses compared with Alternatives 1 and 3, but less than Alternatives 4, 5a, and 5b.	Approximately 1,700 acres of land are subject to institutional controls. Hence, Alternative 3 requires more administrative coordination than Alternatives 2, 4, 5a, or 5b. Alternative 3 requires the same level of coordination as Alternative 2 to effectively implement controls on chat recycling. Landowner access agreements and easements are expected to be facilitated under Alternative 3 by allowing continued chat recycling for a longer period of time	710 acres are subject to institutional controls under Alternative 4, thereby reducing administrative coordination compared with Alternatives 1, 2, 3, and 5a. Coordination of maintenance and deed restrictions is required on about 90 acres of subsidence pit covers under Alternative 4, less than under either Alternatives 5a or 5b. Alternative 4 is dependent on coordination and cooperation with local land owners. However, private property issues due to	Approximately the same level of coordination between EPA and local landowners is needed for Alternative 5a as Alternative 4 or 5b. Permanent easements needed for repositories will preclude other land uses on an estimated 460 acres. This may require actual fee simple acquisition of the sites. Alternative 5a is dependent on coordination and cooperation with local land owners. However, private property issues due to early curtailment of chat recycling may present an	Same as Alternative 5a. However, Alternative 5b allows the greatest level of flexibility of future land uses, as only 280 acres are permanently affected.

Table 10 Comparative Analysis of Remedial Alternatives with Respect to Implementability
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Administrative Feasibility (continued)			than other alternatives, except Alternatives 1 and 2. Alternative 3 allows less flexibility of future land uses compared with Alternatives 2, 4, 5a and 5b, but greater than Alternative 1.	early curtailment of chat recycling may present an obstacle to landowner cooperation and implementability. Alternative 4 allows greater flexibility of future land uses compared with Alternatives 1, 2, 3, or 5a but less than Alternative 5b.	obstacle to landowner cooperation and implementability. Alternative 5a allows less flexibility of future land uses compared with Alternatives 2, 4, and 5b, but greater than Alternatives 1 and 3.	
Availability of Labor and Materials	All services and materials are readily available.	Biosolids availability within a reasonable distance from the Site is limited to about 20 to 40 dry tons per day. Under Alternative 2, biosolids supplies limit the rate at which mill waste deposits can be remediated.	A large quantity of soil is needed to implement Alternative 3. While the soils are available locally, using such large quantities of this non-renewable resource may deplete the locally available supplies. Biosolids availability is not a rate limiting factor because the reliance on soil covers proposed under Alternative 3 reduces the quantity of biosolids needed.	Equipment, technologies, and skilled workers needed to implement Alternative 4 are readily available. Smaller quantities of cover soils are required for capping the filled subsidence pits than under Alternatives 5a and 5b. Transition zone soils and soils beneath waste piles to be excavated are sufficient for construction of the soil covers under Alternative 4.	Equipment, technologies, and skilled workers needed to implement Alternative 5a are readily available. Larger quantities of cover soils are required for capping the on-site repositories under Alternative 5a than under Alternatives 4 or 5b. However, transition zone soils and soils beneath waste piles to be excavated are sufficient for construction of the soil covers under Alternative 5a.	Equipment, technologies, and skilled workers needed to implement Alternative 5b are readily available. Smaller quantities of cover soils are required for capping the under this alternative compared to Alt. 5a but more than Alt. 4. Transition zone soils and soils beneath waste piles are sufficient for construction of the soil covers.

Table 11 Comparative Analysis of Remedial Alternatives with Respect to Cost
Jasper County, Missouri

Criterion	Alternative 1 No Further Action	Alternative 2 Source Consolidation, In-Place Containment through Revegetation Using Biosolids, and Recycling	Alternative 3 Source Consolidation, In-Place Containment Using Simple Soil Covers, Revegatation, and Recycling	Alternative 4 Source Removal and Subsidence Pit Disposal	Alternative 5a Source Removal and On-Site Aboveground Disposal	Alternative 5b Source Removal and On-Site Aboveground Disposal and Water Treatment
Capital Cost	None	$44,312,000	$77,112,000	$58,543,000	$93,707,000	$81,296,000
Annual Operation and Maintenance	$9,700	$101,000	$83,600	$22,500	$137,000	$102,000

Table 12 Detailed Cost Analysis for Alternative 4

Item No.	Item Description	Estimated Quantity	Units	Unit Price	Total Est. Cost	Comments and Assumptions
1.	**Excavate and Dispose of In/Near Stream Chat Sediment Sources in On-Site Subsidence Pits**					
	a. Excavate and load chat	2150761	cu.yds.	$3.50	$7,527,664	Actual cost from 2002 Cherokee County remedial action.
	b. Transport and dump chat in subsidence pits	2150761	cu.yds.	$0.45	$967,842	Assumes a 2 mile roundtrip haul.
	c. Excavate and haul cover soils	107448	cu.yds.	$8.80	$945,542	Assume 18 in. of borrow soil hauled 10 miles roundtrip
	d. Place and lightly compact cover soils	107448	cu.yds.	$1.82	$195,555	
	e. Furnish and install GCL liner material	214896	sq.yds.	$5.40	$1,160,438	Assume Bentomat or equivalent material
	f. Furnish and install drainage fabric	214896	sq.yds.	$2.25	$483,516	
	g. Revegetate geo-composite cover system	44.4	acres	$1,285.00	$57,102	Assume hydroseeding with mulch
	h. Install drainage and erosion controls	4929	lin.ft.	$7.60	$37,458	Assume staked hay bales not replaced after reveg.
	i. Deep till excavated area	863.8	acres	$720.00	$621,936	
	j. Add organic matter to excavated areas	8638	tons	$30.00	$259,140	Assume 10 tons organic matter/acre, spread and tilled
	k. Revegetate excavated area	863.8	acres	$1,285.00	$1,109,983	Assume hydroseeding with mulch
	Subtotal Chat Disposal				**$13,366,177**	
2.	**Excavate and Dispose of In/Near Stream Tailings and Tailings Sediment Sources in On-Site Subsidence Pits**					
	a. Excavate and load tailings	324315	cu.yds.	$3.90	$1,264,829	Actual cost from Waco study, short haul with scrapers.
	b. Transport and dump tailings in subsidence pits	324315	cu.yds.	$0.45	$145,942	Assumes a 2 mile roundtrip haul.
	c. Excavate and haul cover soils	16214	cu.yds.	$8.80	$142,683	Assume 18 inches of borrow soil hauled 5 miles it.
	d. Place and lightly compact cover soils	16214	cu.yds.	$1.82	$29,509	
	e. Furnish and install GCL liner material	32428	sq.yds.	$5.40	$175,111	Assume Bentomat or equivalent material
	f. Furnish and install drainage fabric	32428	sq.yds.	$2.25	$72,963	
	g. Revegetate geo-composite cover system	6.7	acres	$1,285.00	$8,610	Assume hydroseeding with mulch
	h. Install drainage and erosion controls	1915	lin.ft.	$7.60	$14,551	Assume staked hay bales not replaced after reveg.
	l. Deep till excavated area	263.8	acres	$720.00	$189,936	
	j. Add organic matter to excavated areas	2638	tons	$30.00	$79,140	Assume 10 tons organic matter/acre, spread and tilled
	k. Revegetate excavated area	263.8	acres	$1,285.00	$338,983	Assume hydroseeding with mulch
	Subtotal In/Near Stream Tailings Consolidation				**$2,462,257**	
3.	**Excavate and Dispose Upland Chat in On-Site Subsidence Pits**					
	a. Excavate and load chat	1626229	cu.yds.	$3.50	$5,691,802	Actual cost from 2002 Cherokee County remedial action
	b. Transport and dump chat in subsidence pits	1626229	cu.yds.	$0.45	$731,803	Assumes a 2 mile roundtrip haul.
	c. Excavate and haul cover soils	81311	cu.yds.	$8.80	$715,541	Assume 18 in. of borrow soil hauled 5 miles it.
	d. Place and lightly compact cover soils	81311	cu.yds.	$1.82	$147,987	
	e. Furnish and install GCL liner material	162623	sq.yds.	$5.40	$878,164	Assume Bentomat or equivalent material
	f. Furnish and install drainage fabric	162623	sq.yds.	$2.25	$365,902	
	g. Revegetate geo-composite cover system	33.6	acres	$1,285.00	$43,176	Assume hydroseeding with mulch
	h. Install drainage and erosion controls	4288	lin.ft.	$7.60	$32,585	Assume staked hay bales not replaced after reveg.
	i. Deep till excavated area	1180	acres	$720.00	$849,600	
	j. Add organic matter to excavated areas	11800	tons	$30.00	$354,000	Assume 10 tons organic matter/acre, spread and tilled
	k. Revegetate excavated area	1180	acres	$1,285.00	$1,516,300	Assume hydroseeding with mulch
	Subtotal Upland Chat				**$11,326,858**	

Table 12 Detailed Cost Analysis for Alternative 4

4.	**Excavate In/Near -Stream Veg'd Chat and Veg'd Chat Sed. Sources and Dispose of in On-Site Subsidence Pits**				
	a. Clear and grub veg'd chat areas	258.1 acres	$2,000.00	$516,200	Actual cost from 2002 Cherokee County remedial action
	b. Excavate and load chat	225296 cu.yds.	$3.50	$788,536	Actual cost from 2002 Cherokee County remedial action
	c. Transport and dump chat in subsidence pits	225296 cu.yds.	$0.45	$101,383	Assumes a 2 mile roundtrip haul.
	d. Excavate and haul cover soils	11265 cu.yds.	$8.80	$99,130	Assume 18 in. of borrow soil hauled 5 miles it.
	e. Place and lightly compact cover soils	11265 cu.yds.	$1.82	$20,502	
	f. Furnish and install GCL liner material	22530 sq.yds.	$5.40	$121,660	Assume Bentomat or equivalent material
	g. Furnish and install drainage fabric	22530 sq.yds.	$2.25	$50,692	
	h. Revegetate geo-composite cover system	4.7 acres	$1,285.00	$5,982	Assume hydroseeding w ith mulch
	i. Install drainage and erosion controls	1604 lin.ft.	$7.60	$12,187	Assume staked hay bales not replaced after reveg.
	j. Deep till excavated area	258.1 acres	$720.00	$185,832	
	k. Add organic matter to excavated areas	2581 tons	$30.00	$77,430	Assume 10 tons organic matter/acre, spread and tilled
	l. Revegetate excavated area	258.1 acres	$1,285.00	$331,659	Assume hydroseeding with mulch
	Subtotal In/Near Veg'd Chat, etc.	**$2,311,192**			
5.	**Excavate and Dispose of Acidic Overburden in Wild Goose Pit**				
	a. Excavate and load overburden	335700 cu.yds.	$3.90	$1,309,230	Actual cost from Wacostudy, short haul with scrapers.
	b. Transport and dump overburden in subsidence pits	335700 cu.yds.	$0.45	$151,065	Assumes a 2 mile roundtrip haul.
	c. Deep till excavated area	39 acres	$720.00	$28,080	
	d. Add organic matter to excavated areas	390 tons	$30.00	$11,700	Assume 10 tons organic matter/acre, spread and tilled
	e. Revegetate excavated area	39 acres	$1,285.00	$50,115	Assume hydroseeding with mulch
	f. Excavate and place soils for berm around pit	4500 cu.yds.	$6.24	$28,080	Assume an earthen berm 4 ft. high (1.2 cy/lin.ft)
	g. Construct lined diversion channel	3750 lin.ft.	$3.03	$11,363	Assume 60 mil HOPE liner under soil cover
	h. Construct open limestone drain	750 sq.yds.	$65.00	$48,750	Limestone cobbles placed in natural drainage channel
	Subtotal Acidic Overburden	**$1,638,383**			
6.	**Deep Till Upland Veg'd Chat, Add Biosolids and Revegetate**				
	a. Deep till upland veg'd chat	617.7 acres	$1,720.00	$1,062,444	Includes some clearing and grubbing.
	b. Add biosolids to upland veg'd chat	46327.5 dry tons	$30.00	$1,389,825	Assume 75 dry tons biosolids per acre
	c. Add lime to upland veg'd chat	6177 tons	$12.75	$78,757	Assume 10 tons of lime per acre
	d. Revegetate tilled upland veg'd chat	617.7 acres	$1,285.00	$793,745	Assume hydroseeding with mulch
	Subtotal Upland Veg'd Chat	**$3,324,770**			
7.	**Excavate Transition Zone Soils Exceeding Risk-Based Criteria and Use for Cover Soil**				
	a. Excavate and load T-zone soils	217800 cu.yds.	$0.00	$0	Costs included in No. 1, 2, and 3 above.
	b. Transport and place T-zone soils on covers	217800 cu.yds.	$0.00	$0	Costs included in No. 1, 2, and 3 above.
	c. Deep till excavated area	135 acres	$720.00	$97,200	
	d. Add organic matter to excavated areas	1350 tons	$30.00	$40,500	Assume 10 tons organic matter/acre, spread and tilled
	e. Revegetate excavated area	135 acres	$1,285.00	$173,475	Assume hydroseeding with mulch
	Subtotal In/Near Stream T-Zone Soils	**$311,175**			

Table 12 Detailed Cost Analysis for Alternative 4

8.	**Deep Till Remaining T-Zone Soils Exceeding Risk Based Criteria, Add Biosolids and Revegetate**				
	a. Deep till T-zone soils	1337 acres	$1,220.00	$1,631,140	Includes light clearing and grubbing.
	b. Add biosolids to T-zone soils	13370 dry tons	$30.00	$401,100	Assume 10 dry tons biosolids per acre
	c. Add lime to T-zone soils	13370 tons	$12.75	$170,468	Assume 10 tons of lime per acre
	d. Revegetate tilled T-zone soils	1337 acres	$1,285.00	$1,718,045	Assume hydroseeding with mulch
	Subtotal Upland T-Zone Soils	**$3,920,753**			
9.	***Excavated Bed and Bank Sediments and Dispose of in Subsidence Pits***				
	a. Excavate sediments	8900 cu.yds.	$3.90	$34,710	Actual cost from Waco study, short haul with scrapers
	b. Transport and place sediments in waste cells	8900 cu.yds.	$0.45	$4,005	Assumes a 2 mile roundtrip haul.
	c. Restore excavated areas	20459 lin.ft.	$10.00	$204,590	Best guess
	Subtotal Sediments	**$243,305**			
10.	**Implement Drainage and Erosion Controls**				Total approximate length = 74,000 lin.ft.
	a. Install riprap revetment - ungrouted	16444 sq.yds.	$65.00	$1,068,889	Assume 10 percent of total length
	b. Install berms	54815 cu.yds.	$6.20	$339,852	Assume 20 percent of total length
	c. Regrade excavated areas	164444 sq.yds.	$1.85	$304,222	Assume total area fine graded, small irregular areas.
	d. Install geotextile erosion control material	41111 sq.yds.	$1.21	$49,744	Assume 25 percent of total
	e. Revegetate excavated areas	34.0 acres	$1,285.00	$43,659	Assume hydroseeding with mulch
	Subtotal Drainage and Erosion Controls	**$1,806,367**			
11.	**Install Adit Plugs and Drainage Ditches**				
	a. Install adit plugs	100 each	$10,000.00	$1,000,000	Best guess
	b. Install upgradient diversion ditches	50000 lin.ft.	$13.25	$662,500	Best guess
	c. Head walls, berms, riprap, etc.	1 lump sum	$500,000.00	$500,000	Best guess
	Subtotal Adit Plug and Diversion Ditches	**$2,162,500**			
12.	**Institutional Controls**				
	a. Health Education	10 years	$125,000.00	$1,250,000	
	b. Health ordinance - building code	10 years	$60,000.00	$600,000	
	Subtotal Institutional Controls	**$1,850,000**			
13.	**Indirect Capital Costs**				
	a. Negotiate landowner agreements	1 lump sum	$100,000	$100,000	Assume 1% of total direct capital cost
	b. Remedial design	1 lump sum	$2,143,687	$2,143,687	Assume 5% of total direct capital cost
	c. Construction oversight and management	1 lump sum	$3,001,162	$3,001,162	Assume 7% of total direct capital cost
	d. Contingencies	1 lump sum	$8,574,747	$8,574,747	Assume 20% of total direct capital cost
	Subtotal Indirect Costs	**$13,819,596**			
	Total Alternative 4 Capital Costs			**$58,543,332**	
14.	**Annual Operation and Maintenance Costs**				
	c. Monitoring and maintenance of repository caps	90 acres	$250.00	$22,500	
	Subtotal Annual O&M Costs – Alternative 4	**$22,500**			

Table 12 Detailed Cost Analysis for Alternative 4

Biosolids costs assume cake with 20% solids at $6.00 per wet ton delivered and applied.
Note: Total transportation and application costs per dry ton are $30.00.
1. Source: Brown *et al.* 2001, and Ed Malters, City of Springfield, Mo.

Lime costs assume agricultural lime at $5.75 per ton plus $7.00 transportation and spreading.
Source: Brown *et al.* 2001.

2. A total of 66,725 dry tons of biosolids are applied under this alternative. This represents 9.1 years of total daily production of Springfield, Mo., at the current rate of 20 dry tons per day.

3. Geo-composite cover systems consist of 18 inches of soil, a GCL, and drainage layer placed over the wastes and revegtated. Approximatley7 217,8000 cubic yards of cover soils are needed to implement Alternative 4. This volume of soil
4. can be obtained from transition zone soils. Capped areas cover approximately 89.4 acres.

Alternative 4 assumes approximately 25 percent of upland chat (543,000 cubic yards) is removed by recycling.

5. The present worth analysis assumes 30 years of O&M at a discount rate of 3 per cent. Direct capital costs are spread evenly throughout years 2 through 7 when remedial actions are assumed to be completed. Indirect costs are spread out over the first 6 years of remediation.
6. The first 5 years of O&M costs reflect administration of landowner agreements, but are reduced and distributed evenly over last 25 years of the present worth period.

Appendix A

Responsiveness Summary

RESPONSIVENESS SUMMARY

OPERABLE UNIT 1
MINE AND MILL WASTE
ORONOGO-DUENWEG MINING BELT SITE
JASPER COUNTY MISSOURI

Introduction

This Responsiveness summary has been prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and the National Contingency Plan (NCP) 40 CFR § 300.430(f). This document provides the United States Environmental Protection Agency's (EPA) response to all significant comments received on the Proposed Plan from the public during the 30-day comment period.

On July 19, 2004, the EPA released the Proposed Plan and Administrative Record File containing pertinent documents for cleanup of OU-1 for public review and comment. The Proposed Plan discussed the EPA's proposed action to address Oronogo-Duenweg Mining Belt site (Site) source materials contaminated with lead and cadmium. The public comment period was open from July 19 to August 19, 2004. The EPA held a public meeting on August 3 at Missouri South State College in Joplin, Missouri, to present the Proposed Plan and discuss results of investigations and feasibility study. A copy of the transcript from the public meeting is included in the Administrative Record File.

Comments Received from the Public and Responses

The following comments were received in writing during the public comment period.

Several comments were received from the Kansas Department of Health (KDHE) and Environment and the Oklahoma Department of Environmental Quality (ODEQ) regarding their concern that the EPA is not specifying the removal of contaminated sediments from Class P streams in the Site. Both state agencies are concerned that contaminated sediments from Missouri streams will migrate into their respective states, which will impair surface water quality to the point where Water Quality Criteria cannot be met. The EPA provides the following response to those concerns.

During 2003, the EPA and the potentially responsible party (PRP) assessed and analyzed sediment bar deposits in Turkey, Center, and Shoal Creeks. Lead and zinc concentrations in Shoal Creek deposits range from 100 to 500 parts per million (ppm) lead and 800 to 1900 ppm zinc. Lead and zinc concentrations in Center Creek deposits range from 100 to 500 ppm lead and 1300 to 2900 ppm zinc. Lead and zinc concentrations in Turkey Creek deposits range from 300 to 500 ppm lead and 1700 to 3700 ppm zinc. During the Remedial Investigation, conducted from 1991 to 1995, stream sediment samples in Spring River, Turkey, Short, and Center Creeks were collected and analyzed. The results indicated the sediment concentrations in Spring River

meet the EPA's sediment values at the locations sampled in Missouri at 1 to 1.4 ppm cadmium, 15 to 20 ppm lead, and 100 to 250 ppm zinc. Background concentrations, upstream of the Site designated areas were 1.4 ppm cadmium, 20 ppm lead and 250 ppm zinc. Sediments in Turkey Creek contained 13 to 19 ppm cadmium, 60 to 240 ppm lead, and 1070 to 4800 ppm zinc. Sediments in Center Creek contained 0.6 to 68 ppm cadmium, 17 to 240 ppm lead, and 120 to 2870 ppm zinc. Sediments in Short Creek contained 17 to 19 ppm cadmium, 60 to 180 ppm lead, and 3100 to 3500 ppm zinc.

The EPA has established sediment cleanup criteria in the OU-1 ROD for tributaries to the Class P streams and delta deposits at the mouths of these tributaries for the Site at 2 ppm cadmium, 70 ppm lead, and 250 ppm zinc. The removal of a significant volume of sediments from the tributaries during non-flowing periods is planned. Theses actions would only take place following remediation of the erodable uplan and near-stream deposits of mill wastes in the watersheds. However, the data reported above indicates that, with the exception of Spring River (which is close to the action level for zinc even at the upstream, background location) all reaches of the Site streams exceed the cleanup criteria for cadmium, lead, and zinc. In order to fully meet the cleanup criteria for sediments in the short term, all sediments from Turkey, Center, Short, and Shoal Creeks would have to be removed throughout the entire Site, and possibly significant reaches of Spring River. This would result in the removal of nearly 60 miles of stream sediments, excluding the Spring River.

The EPA is not recommending removal of sediments in the Site Class P stream for the reasons listed below.

- The remedial action objectives developed for the remedial action at the Site specify cleanup of source material to achieve federal water quality standards in the Class P streams. Modeling conducted during the feasibility study process indicated the water quality in the streams would meet those criteria with a 90% reduction in loading to the streams via the tributaries. The EPA believes the federal standards for surface water quality can be achieved through the actions specified in the ROD without total sediment removal in the Class P streams. Or conversely, under post-remedy conditions, the EPA does not believe that the remaining sediments in Class P streams, as a metals source, are sufficiently mobile that they would independently cause an exceedance of federal water quality standards.

- Sediment metals concentrations in the Class P streams are relatively homogenous throughout their reaches. Any cleanup to remove the sediments exceeding cleanup criteria would involve total sediment removal. This would result in destruction of the habitat in the steam channels, and possibly significant damage to the riparian habitat during stream access for the removal of sediments. Furthermore, total sediment removal would adversely affect stream geomorphology due to changes in the sediment balance, potentially causing erosion problems.

- Habitat range for the Neosho Madtom, a federally listed endangered species, includes the Class P streams in Missouri. Neosho Madtom individuals have been found in the Spring River in Missouri. Viable habit for the Madtom exists in Center and Shoal Creeks.

Destruction of habitat for this organism would be unacceptable to the EPA and the fish and wildlife agencies with jurisdiction for this area.

- U.S. Fish and Wildlife Service and the Missouri Department of Conservation have expressed to the EPA that destruction of habitat, and the subsequently long recovery period, is not an acceptable tradeoff for meeting surface water quality throughout the entire reaches of the streams.

- Stream sediment removal is very difficult to achieve without significant release and remobilization of suspended particles downstream. Total sediment removal in the Class P steams at the Site would likely result in a massive short-term release of sediments downstream to Kansas and Oklahoma.

- Currently sediments in the bar deposits, visible above the low water mark in the Class P stream appear relatively stable. Generally the bars consist of large gravel to cobble size particles with 15 to 30 percent sand or finer fractions. Most bars appear well armored with very coarse gravel and cobbles, and are generally well vegetated with many deposits containing large mature trees. The physical conditions of the sediment deposits visible in the streams indicate they are not subject to any significant erosion, even under high flow conditions. A significant reduction in mobile sediments (bedload) is anticipated as a result of the actions prescribed in the ROD.

- The cleanup action selected in the ROD will result in the removal and disposal of all mine and mill waste sediment sources to the Class P streams. Future sediment loading from mined areas to the steams will be mitigated. However, flood-plain and upland soils will remain that contain metals concentrations below the EPA's cleanup standards but exceeding the sediment criteria. These flood-plain soils have potential to erode into the streams during flooding, which could potentially re-contaminate streams which were remediated. Preventing this situation would require removal of all flood-plain soils, and soils in upland areas subject to erosion into the tributaries exceeding sediment cleanup criteria. In other words, recontamination of the Class P stream sediments could only be prevented by removal of all mine and mill wastes and soil exceeding 2 ppm cadmium, 70 ppm lead, and 250 ppm zinc; i.e., the entire Site would require remediation to background concentrations. A removal action of this scope is not technically or economically feasible.

- Re-establishment of habitat to natural conditions after total sediment removal may take scores of years to accomplish.

- Adequate habitat and significant fish populations occur in the Site Class P streams under current conditions. Although RI/FS activities conducted to assess ecologic risks at the Site identified some aquatic invertebrate populations that were thought to be adversely affected, overall fish population diversities and densities were observed to be similar to non-mining effected streams in southwest Missouri.

- The EPA has written a provision into the ROD to conduct additional work at the Site should the remedial action fail to result in the Site streams achieving federal water quality criteria. This work may, if needed, be conducted as an amendment to this ROD, or as a separate operable unit.

The KDHE commented that the remedy presented in the Proposed Plan does not provide the level of effort required to remediate the damage to the environment, and therefore is not protective of the environment in Missouri or Kansas.

The EPA strongly disagrees with the KDHE's assessment of the plan. The EPA has followed the requirements of CERCLA and the NCP and has selected a remedy that, not only complies with the requirements, but is fully protective of both human health and the environment. The EPA believes the KDHE has voiced these concerns due to the fact that sediments will not be removed from the Class P streams at this time. See the EPA's response above with regard to this concern.

The KDHE questioned how long a time period will be required until the Site streams return to "background" conditions.

The EPA cannot accurately answer that question. However, the ROD states the stream monitoring plan will be developed and implemented during the cleanup action. Data generated during the monitoring activities will be assessed during the Five-Year Review process. The EPA has specified that should the action fail to meet the established water criteria at the conclusion of the second Five-Year Review, the technical feasibility of conducting additional work will be assessed, and the EPA may recommend additional action.

The KDHE commented that the EPA did not include sediment cleanup criteria in the Proposed Plan.

In response to this comment, the EPA re-evaluated the need for sediment cleanup criteria. The ROD includes sediment cleanup criteria for the Tributaries to the Class P streams and the delta deposits in the Class P steams at the mouths of the tributaries. These criteria are based on Site background soil concentrations.

The KDHE requested the EPA to provide the volume calculations for sediment removal under this action, as well as the volume of contaminated sediment that will be left in the Class P streams.

The Proposed Plan contains the volume of sediment anticipated to be removed. The EPA has not calculated the total volume of contaminated sediments in the Class P streams. Volume estimates for sediment removal form tributaries and delta deposits will be refined during the design phase of the project, prior to remedial actions. These streams include more than 100 miles of channel including Spring River, and Turkey, Center, Short, and Shoal creeks.

The KDHE questioned if sediment monitoring would be part of the surface water quality monitoring program developed for the Site to assess the effectiveness of the remedial action.

The EPA will rely mainly of surface water quality to assess the effectiveness of the remedial action. However, the EPA anticipates including sediment monitoring in the program to monitor contaminant concentrations during and after remediation.

With respect to the summary in the Proposed Plan, KDHE questioned what ARARs the EPA believes will not be met by the action, and what requirements will be waived. They also suggested that if ARARs could not be met, the EPA should suggest a new remedy.

The KDHE has taken these statements out of context in the Proposed Plan. The text in question is simply stating CERCLA requires that ARARs be met or that a waiver of the ARARs be justified in the case that no reasonable action conducted would be capable of achieving ARARs. The EPA believes that the remedy presented in the Proposed Plan and selected in the ROD will achieve ARARs. The EPA is not proposing a waiver of ARARs as part of the remedy for OU-1.

The ODEQ expressed concern regarding change in the ground water hydrology and resulting effect in Oklahoma as a result of filling numerous mine subsidence pits in Missouri. They ask if the EPA has performed any hydrogeologic modeling on the effect of closing multiple mines.

The EPA has not performed any modeling on the change in ground water conditions resulting from the subaqueous disposal of mine and mill wastes into mine subsidence pits then capping the pits. However, all disposal will take place within the shallow aquifer. Hydrogeologically, the Site is separated from Oklahoma by the Spring River and Shoal Creek. Both of these surface water features are relatively large streams and are anticipated to act as capture zones and hydrologic barriers for shallow ground water in the area. It is not anticipated that filling mine pits in Missouri will have an impact on the water table or recharge to the aquifer in Oklahoma.

The ODEQ cautioned the EPA that studies on deep tilling, as selected in the ROD for transition zone soils, in Oklahoma showed that levels of heavy metals actually increased with the tilling.

In response to this comment, the EPA will assess the effects of deep tilling in areas where this activity will occur. Samples will be collected and analyzed after the tilling to ensure that deep tilling results in metals concentrations below the action level.

The Natural Resource Trustees for Missouri (Trustees) which include the Missouri Department of Natural Resources, Missouri Department of Conservation, and the U.S. Fish and Wildlife Service, commented that no information was provided in the Proposed Plan describing how the footprint of contaminated areas would be addressed after the removal and disposal of the wastes.

The Proposed Plan clearly stated that excavated areas would be graded to promote runoff, and then revegetated. In response to this comment, additional language has been added in the ROD to specify regrading will be conducted to ensure the excavation activities will not cause ponding of water, unless the wastes are in deep depressions and the land owner specifically agrees to the construction of a pond during the removal of the wastes. In the case that all wastes can not be removed for a specific site, the ROD envisions the use of soil capping techniques to cover the wastes in place.

The Trustees question what actions will be conducted by the EPA in the Highway 249 corridor because of the delay in funding by the Missouri Department of Transportation (MDOT) to construct the highway using 600,000 cubic yards of mine wastes for construction fill, as specified in EPA's July 2000 EE/CA.

At this time, the EPA does not anticipate taking any action in the area specified for cleanup by MDOT. The EPA understands that funding for that project is forthcoming, although it may not be available for a few years. The EPA will reassess this position near the end of the remedial action specified in this ROD, and determine the progress of MDOT on their activities. If it appears MDOT will not complete their portion of the cleanup within a reasonable timeframe, the EPA may address the remaining source materials in the highway corridor.

The Trustees stated that barren chat that does not support earthworms because of its toxicity creates a loss of habitat to migratory birds and other wildlife.

The ROD specifies that all source materials exceeding the human health and terrestrial cleanup criteria will be removed and disposed. The cleanup level is based on remedial goals. The EPA remedial actions are to conduct cleanup to protect human health and the environment. The loss of habitat may be an additional damage to the Site. Although it is usually an incidental benefit of the EPA's remedial action, habitat restoration is not the EPA's primary goal for cleanup.

The Trustees commented that the remedial action does not address zinc toxicity to plants from the Site source materials.

The EPA acknowledges this fact. The remedy selected in the ROD was designed to mitigate risks posed from sources at the Site to human health and the environment as a whole. Typically, the EPA selects and designs remedies to be protective of the ecosystem, not just specifically plants.

When selecting assessment ecological endpoints and receptors of concern, there are three criteria to consider: (1) ecological relevance, (2) susceptibility to the contaminants of concern, and (3) relevance to risk management goals. Plant communities are an ecologically relevant receptor because they help sustain the natural structure, function, and biodiversity of the terrestrial ecosystem. However, the susceptibility of plant communities at the Site remains uncertain. Ecological receptors are considered susceptible when they are sensitive to the contaminants to which they are exposed. Although soil concentrations may exceed phytotoxicity reference values, viable plant communities are present at the Site, which indicates that the sensitivity and tolerance of the natural plant communities at the Site are not comparable to laboratory test species.

Finally, plant communities may not represent a receptor that is relevant to the risk management goals for this site. Due to the nature of the impacts to this ecological system, achievable risk management goals are being based on other ecological values, such as higher trophic level terrestrial birds and mammals.

The Trustees commented that the technical impracticability (TI) waiver issued by the EPA for ground water (OU 4) applied only to drinking water and allowed limited ground water remediation as part of subsequent remedies. They stated ground water may need to be remediated to address ecological risk, and that ground water provides the base flow for streams and should be remediated.

The ROD includes actions to address ground water where it can be shown to directly discharge to surface water streams. This is mainly addressed through shaft plugging and treatment of waters discharging from overflowing shafts. The TI waiver provides rational for the EPA's decision to not remediate all contaminated ground water. However, the OU-1 ROD contains engineered actions to specifically mitigate metals leaching to ground water and subsequent discharge to surface water. The EPA believes metals concentration in the base flow in streams will be significantly reduced due to implementation of the actions described in the ROD.

The Trustees commented that 18 inches of agronomic soil cover over disposed wastes is not sufficient from a plant community or habitat perspective, or to prevent burrowing animals from contacting the disposed wastes.

The purpose of the agronomic soil cover is to prevent direct exposure to, and erosion of the disposed wastes. The EPA is proposing to revegetate the covered disposed wastes with native grasses to prevent erosion of the caps, which will provide additional viable habitat. Actions taken pursuant to this ROD will result in the least amount acreage for disposal and capping of waste, thus the least amount of cap area, of any of the identified remedial alternatives. Additionally, the selected remedy will provide for the largest acreage of restored habitat, by removing the wastes from the largest amount of land, of any of the identified alternatives. An 18 inch soil cover is adequate for grass production. With respect to burrowing animals, the EPA believes the occurrence will be insignificant in the Site as a whole to create an unacceptable risk.

The Trustees commented that the Quapaw Tribe in Oklahoma has recently proposed their own water quality standards, which may be different from Missouri's.

The ROD specifies the surface water cleanup criteria as federal water quality standards, which are currently more stringent than Missouri's standards. Additionally, the EPA selected the federal standards since the state of Kansas, as the receiving state for surface water, has adopted the federal standards. If the Quapaw Tribe is authorized by the EPA, Region 6 to establish water quality standards, and should Quapaw standards be established which are more stringent than federal standards, the EPA will consider modifying the ROD based on the more stringent Tribal water quality standards, if it is determined that Quapaw lands receive waters from the Site. However, in general, ARARs for cleanup are set at the time of the ROD.

The Trustees requested that willow or cedar revetments or other natural bank stabilization techniques be use for stream restoration as apposed to stone rip-rap.

The EPA has included language in the ROD to this satisfy this request. The ROD includes a preference for using willows, cedars, and other natural vegetation over stone rip-rap for stream bank stabilization.

The Trustees question what measures will be taken to control the disposal pits during the one year settling period, and what actions will be taken if settling occurs once the pit is closed.

Pits will be surcharged with disposal material during filling and allowed to settle for one year. Erosion controls, such as silt fencing, will be placed around the pits to control runoff during the settling period. After one year, the pit material will be graded to promote proper runoff and capped. Settling after the one year period but before completion of the remedy will be corrected during the remedial action. Settling after the completion of the remedy will be corrected as part of operation and maintenance.

The trustees commented that a more specific ground water monitoring plan needs to be developed to adequately assess short and long-term release of metals.

The EPA has included additional language in the ROD which defines monitoring requirements.

The Trustees strongly recommended against using the Wild Goose pit for subaqueous disposal due to its acidic nature, and further that partial filling may create an attractive nuisance. The MDNR also expressed concerns about the filling of the Wild Goose pit.

The EPA understands this concern and included provisions in the Proposed Plan and ROD for treatability and pilot studies at the Wild Goose pit to assess the feasibility of neutralizing the acid water prior to disposal. The EPA has also included the option, if necessary, to fill the pit completely and eliminate the attractive nuisance problem.

The MDNR commented that the EPA should develop numeric criteria for cleanup of tributary sediments and delta deposits at the mouths of the tributaries in the Class P streams. They suggested the criteria be based on the McDonald sediment criteria or background soil concentrations as an alternative.

The EPA has included numeric criteria in the ROD. These criteria are based on background soil concentrations. The background concentrations are also similar to the McDonald sediment criteria.

The MDNR commented that historical fish tissue samples from the Site streams, as well as ongoing fish sampling data by other agencies, should be used during the development of the Surface Water Monitoring Plan.

The Surface Water Monitoring Plan will be developed during the remedial design phase of the project. The EPA will consider, and include as appropriate, the use of fish tissue data in development of the plan. The EPA will also include the MDNR in development of the plan.

The Missouri Department of Health and Senior Services commented that they understood the EPA would be supporting several local agencies to implement the health ordinance as apposed to one "overarching" authority. They expressed concern on the effectiveness of this approach.

The EPA is proposing to fund the Jasper County Health Department (JCHD) to establish and implement the health ordinance to control residential construction with the Site. The EPA understands from conversations with the JCHD that they will likely work with the various municipalities within the Site to establish cooperative agreements for implementation and enforcement of the ordinance. However, the EPA anticipates that JCHD will be the governing authority for the ordinance.

The JCHD and the Environmental Task Force of Jasper and Newton County (Task Force) commented that costs to conduct the health education and institutional controls activities described in the Proposed Plan were not included in the Plan.

The EPA inadvertently neglected to include cost for the health education and institutional controls activities. A cost of $1,850,000 for a 10 year period for health education and institutional controls was added to the cost estimate in the ROD.

The JCHD and the Task Force commented that the cleanup standards for upland waste piles (specified in the Proposed Plan) is significantly higher than the standards required for residential yards. They stated that this would require continued enforcement of the building restrictions after the OU-1 activities are complete, and would create a financial difficulty (on the county) if the EPA does not plan to fund the ICs in perpetuity.

The EPA agrees with the JCHD and has lowered the cleanup criteria in the ROD for the Site sources from those presented in the Proposed Plan to now be in agreement with the cleanup standards for residential yards.

The Task Force commented that they believe it is essential for the EPA to continue funding health education, and to fund the ICs once implemented, until the cleanup activities at the Site are complete.

The EPA intends to fund both these program until cleanup is complete. The ROD includes costs for these activities.

The Jasper County Superfund Site Coalitions (Coalition) raised questions regarding how waste piles will be identified for removal and how samples will be collected and metals concentrations determined.

Details concerning sample collection methods, waste pile identification methods, and disposal pit identification will be developed during the remedial design. The EPA intends to involve the Coalition in the development of the design and associated work plans for conducting the remedial action. The coalition will have opportunity to provide input and comments on these issues prior to the remedial action.

The Coalition raised concern that waste piles may be left in place after the cleanup, which tested low and were not disposed, but may later be removed by the property owner which could result in contaminated fines remaining in the footprint of the pile.

The EPA will take this possibility into account when developing the remedial action work plans and sampling plans to ensure this situation does not arise. Sample collection methods will be developed to base the waste pile remove on the fine fraction concentration, as well as, underlying soil concentrations.

The Coalition questioned if there will be a need to control access to remediated areas after cleanup is complete, and how that control would be implemented.

The EPA anticipates that access control will not be required in any areas where wastes are removed since the remaining soil will not exceed any health based action levels once the remediation is complete. Direct access control is not required for the disposal areas since the wastes will be capped and direct human contact with the contaminated wastes will be eliminated assuming the caps are not disturbed. However, to ensure that the caps are not disturbed, and the wastes remain in place under the caps, the EPA will work with individual property owners to implement institutional controls on the disposal areas. These controls will most likely be in the form of deed notices and restrictions and would prevent disturbance of the caps. Activities that involve disturbance of the cap, such as excavation, and construction of any buildings on the cap, would be prohibited by the deed restriction.

The Coalition questioned whether there is sufficient mine subsidence pit volume for disposal of the wastes on site considering many of the pits are unacceptable for use in disposal because of proximity to streams or their high quality habitat.

The EPA believes there will be sufficient pit space for disposal, even excluding numerous pits, but the final analysis will be determined during the remedial design. Should the remedial design analysis show an insufficient pit volume, the EPA will likely issue an amendment to the ROD to specify alternative actions to be taken. If required, the alternative action would consist of one of the alternatives, such as soil capping, identified in the FS.

The Coalition questioned if the use of nutrient rich biosolids create a problem in Site surface water, and whether sufficient amounts of biosolids existed to complete the remedial action in a reasonable time frame.

The EPA assessed the question of nutrient runoff to surface water during several biosolids pilot studies at the Site through the collection of surface and ground water samples at the demonstration sites. Water sample analytical data indicated that excessive nutrient runoff or leaching is not a significant problem with biosolid application to land at the rates applied during the studies.

The EPA has re-assessed the volumes of required biosolids presented in the Proposed Plan, and determined that the volumes were indeed excessive. Volumes presented in the plan represent the maximum amount of biosolids that may be required to promote proper plant growth. Actual amounts of biosolids needed to conduct the remedial action will be refined during remedial design. However, biosolid volumes have been revised and reduced in the ROD to more accurately reflect the amount that may be required for the remedial action. Sufficient volumes of biosolids should be available from various sources, including animal wastes and POTWs, to provide the volume needed.

The Coalition commented that additional ground water samples should be collected from the monitoring wells surrounding the Waco demonstration disposal pit.

The EPA will collect additional samples from the Waco wells during the remedial design, and add sample data collected from the wells proposed for installation surrounding the first few disposal pits fillings to the demonstration project database.

The Coalition questioned why the cities within the Site have not adopted the institutional controls for residential development specified in the OU-2/3 ROD and in the OU-1 Proposed Plan.

The Task Force is developing a draft institutional controls ordinance for residential development that will be presented to the Jasper County Commission for their consideration and adoption. To date, cities within the Site and Jasper County have been reluctant to adopt the ordinance due to varying authorities and the financial burden of implementing the ordinance. The EPA has specified in this ROD that it will fund the county to implement a Site wide ordinance.

The Coalition questioned if there was an ordinance in place to prohibit shallow well drilling in the Site.

The MDNR promulgated water well drilling regulations several years ago that prohibits shallow water well installation in contaminated areas of the Site.

The Coalition commented that the EPA should install "alert" signs on all disposal areas to inform the public that the site is a disposal area with underlying contamination.

The EPA does not agree that signs would be permanent or effective, and would likely call unwanted attention to remediate property. The EPA will rely on deed restrictions for disposal properties to protect the public.

The Coalition questioned if Alternatives 2 and 3 in the FS were disqualified since they would not likely achieve a 90 percent reduction in zinc loads needed to comply with federal ALCs in Class P streams, or comply with the terrestrial criteria.

This assessment is correct. Alternatives 2 and 3 were not recommended by the EPA since it is believed they would not result in protection of the environment.

The Coalition question if disposal pits would always be existing pits or if a new pit will be dug.

The EPA will only use existing mine subsidence pits for disposal.

The Coalition asked why some chat and tailings are assumed to not present a risk to human health and the environment.

The EPA has established cleanup action levels based on metals concentrations that were calculated to present a risk to human health and the environment. Some chat and tailings piles simply do not contain metals concentrations above these calculated cleanup criteria.

The Coalitions question the reasoning in the Proposed Plan that truck traffic and dust would be more intense for seven years (under Alternative 4) than Alternative 2 and 3.

Alternative 4 involves excavation and hauling of wastes, while Alternatives 2 and 3 involve capping and treating the wastes in place.

The Coalition commented that the environmental changes (of the remedy) would cause loss of aquatic life by placing waste in subsidence pits and displacing the water.

Some fish may perish while filling the pits. To the maximum extent practicable, the EPA will identify and use low quality fish habitat pits and avoid those with high quality habitat, good water quality, and thriving fish populations.

The Coalition questioned how long chat owners could continue to recycle chat under Alternative 4.

Owners can continue to excavate and sell chat until near the end of the remedial action, at which point all chat exceeding the cleanup criteria will be disposed in accordance with the selected remedy.

The Coalition commented that in the past, the EPA opposed placing mine waste in mine subsidence pits, and questions if this position changed based on recent research.

This is correct. Until recent years, the EPA advised against placing mine wastes in pits for fear of exacerbating ground water contamination. Recent studies now show that proper subaqueous disposal will not significantly increase metals contamination in ground water, and may over the long term, actually improve conditions by closing surface openings that allow highly oxygenated water in recharge to ground water though mine voids.

One citizen questioned if he would receive proceeds from the sale of what is removed from his property. He asked if vertical shafts would be capped

The ROD does not include any EPA sale of chat. The EPA will not compensate property owners for wastes removed for disposal. Only large mine subsidence pits will be filled during the cleanup action. Vertical mine shaft closure is not considered a remedial action to protect human health and the environment from the release of hazardous substances. Vertical shafts are considered to be a "physical" hazard, which the EPA does not respond to.

The following are significant comments received from citizens verbally during the public meeting. All comments and questions during the public meeting can be reviewed in the transcript of that meeting, located in the Administrative Record.

Concern was voiced about the contamination on "smelter hill" and whether the EPA would address this area.

Smelter hill is the area in and around the Eagle-Picher smelter facility in northwest Joplin. During the public meeting, the EPA explained that there is contaminated soil and mine waste in the area north of the Eagle-Pitcher facility that would be addressed by this action. The contamination located directly on the Eagle-Picher facility property is being addressed through actions by Eagle-Picher under the oversight of the MDNR.

Will the EPA monitor the effectiveness of the biosolids application to excavated areas to assess the effectiveness at growing plants over the long term?

The EPA will assess the effectiveness of the remedy every five years. If the excavated areas are not sustaining plant growth, the EPA will conduct additional work to remedy the situation.

What are the priorities for addressing waste piles for cleanup?

The EPA will start the cleanup in the areas that are highly populated, such as the areas around Webb City, Carterville, and Duenweg, or north of the Eagle-Picher smelter in Joplin. Once these areas are remediated, the next priority will be waste piles that are contributing to stream contamination. The final priority will be the remaining piles that create terrestrial risk and future human health risk.

Can land owners sell chat from their property?

The EPA encourages land owners to remove and sell off the chat on their properties, but cautions that chat should only be used in situations that encapsulate the chat, such as asphalt. The EPA recommends only limited uses for chat in the 2003 Fact Sheet on use of mine waste, which is included in the Administrative Record.

Will property owners be compensated for chat taken off their property during the cleanup, and will they be compensated for their land that is tied up in a disposal repository so they can no longer use that part of their land?

The EPA is conducting the cleanup to mitigate risks to human health and the environment. Owners of chat will not be compensated for the cleanup of the hazardous materials on their property. Owners will be given ample time during the remediation project to remove and sell chat before ultimate disposal of remaining chat is required. Neither will landowners be compensated for portions of their property used for disposal or repositories. Landowners will have access to the capped disposal pits, and some limited use, such as grazing, will be allowed.

Has a dye study been conducted to determine what waters of the state may be impacted by waste disposal?

The MDNR conducted a dye study associated with the subaqueous disposal study near the Waco DA. Results of that study were inconclusive with respect to ground water flow and hydrologic conductivity between the mine pit and ground water. The EPA is not planning additional dye studies. However, the EPA will install monitoring wells around the first few pits used for disposal of wastes to further assess the connection of mine pit water to ground water.

Will the EPA use local contractors to conduct the cleanup work?

The EPA has not yet determined which type of contracting vehicle will be used to conduct the cleanup of OU-1. However, the EPA will strive to use local labor to the greatest extent possible.

Where does the water in the pits go when it is displaced from the pit during filling? Is it collected and treated?

The subaqueous demonstration project in Waco indicated the water in the pits rise during the day while wastes are being pushed into the pits, but then subsides overnight to static

conditions. Once the pit in nearly full, the water tends to overflow the pit to the ground surface. In this case, water will be directed into areas where the least impact will be created, and efforts will be made to keep the flow from entering steams. Water overflowing the pits will not be treated. Generally, the metals concentrations in pit water is low and should not cause any negative impacts to surface soils, but will not be discharged to streams. Ideally, the overflowing water will be channeled to areas where it can evaporate. To the extent any water is discharged to streams, it will be in compliance with action specific ARARs.

APPENDIX B1

Consent Decree Appendix B1

SCOPE OF WORK FOR REMEDIAL DESIGN OPERABLE UNIT #06, WACO SUBSITE CHEROKEE COUNTY, KANSAS SUPERFUND SITE EPA I.D. # KSD980741862

SITE

Cherokee County Superfund Site
Operable Unit #06, Waco Subsite
Cherokee County, Kansas

PURPOSE

The purpose of this scope of work (SOW) is to provide a framework for completion of a responsible party remedial design (RD) for non-orphan areas of the Waco subsite portion of Operable Unit #06 (OU-6) of the Cherokee County Superfund Site (Site). The Record of Decision (ROD) for OU6 was released in September, 2004.

As specified in the ROD, the remedy will involve excavation, consolidation, subaqueous disposal, capping, and re-vegetation of surficial mining wastes; removal and disposal of metals-impacted sediments from designated ephemeral channels; and groundwater characterization. Design investigations may be performed to more accurately determine pre-remedial conditions for the design effort. Additional components include long-term operation and maintenance of the completed remedy.

BACKGROUND

The Cherokee County Superfund Site is located in the southeast corner of the State of Kansas and is part of the Tri-State Mining District (District). The District is an inactive lead and zinc mining area that encompasses approximately 2,500 square miles in southeast Kansas, southwest Missouri, and northeast Oklahoma. The District was one of the most productive lead and zinc mining areas in the United States and was mined from the late 1800s to 1970.

The U.S. Environmental Protection Agency (EPA) placed the Cherokee County Superfund Site on the National Priorities List

in 1983. The Site encompasses approximately 115 square miles in southeastern Kansas and is divided into seven subsites designated as Galena, Baxter Springs, Treece, Badger, Lawton, Waco, and Crestline. Figure #1 depicts the Cherokee County Site. The non-orphaned portions of the Waco subsite are the subject of this SOW.

REMEDY

Applicable portions of Waco subsite remedy, as specified in the ROD, consist of the following elements:

* Excavate, consolidate, and/or cap all surficial mine wastes and excavate metals-impacted sediments from designated ephemeral channels. Mining wastes in heavily forested, thickly vegetated areas will not be subject to remediation.

* Utilize subaqueous mine waste disposal to the maximum extent practicable.

* Cap subsidence pits, consolidation areas, tailings impoundments, and in-place chat/tailings areas utilizing topsoil and clay caps with a minimum total thickness of 1.5 feet. The use of other materials in conjunction with soil, such as fly ash, is acceptable pending a successful assessment of viability.

* Re-contour and re-vegetate all disturbed areas and facilitate drainage and erosion controls. Construct sedimentation basins, detention ponds, dikes, berms, and swales to the extent necessary to control run-on and run-off.

* Abandon deep wells to prevent cross-contamination between the shallow and deep aquifers.

* Perform a design investigation to characterize the groundwater flow system in order to monitor the subaqueous mine waste disposal component of the remedy and to determine the need for groundwater institutional controls. Additional design investigation efforts may be directed at further determining the volume and extent of mining wastes and sediments for design purposes.

* Assess the sediments of any water-filled shafts, pits, ponds, or collapse features not filled during the remedial

action. Provide suitable cover, such as soil or rip rap, on near shore sediments that exceed numeric or Site-specific criteria.

WORK STATEMENT

It is assumed that all responsible party work areas will be addressed by a single design effort utilizing a common contractor; however, alternate approaches may be considered. The RD tasks consist of the following elements:

1. Review existing historic information, as necessary, and prepare a design work plan outlining the recommended approach to conduct the design effort. Prepare pre-design (characterization plans and reports) and design submittals (30%, 60%, 90%, 95%, 100% etc.) as specified in the approved RD work plan. All submittals are subject to review and approval by the EPA with input by the State of Kansas. All submittals shall be provided to the EPA and the State of Kansas and shall consist of two copies to the EPA and one copy to the State of Kansas.

2. Prepare design packages to implement the remedy selected in the Cherokee County OU-6 ROD. The packages will consist of engineering plans and specifications and include the following: the pre-design and design document sequence specified in the final approved RD work plan; a design analysis report; a chemical data acquisition plan; an O&M plan for post remedy implementation; a quality assurance project plan; a site safety plan; cost and schedule estimates; a community relations plan; an organizational chart; and progress reports.

3. Reproduce design documents and other reports and documentation, such as analytical data and drawings, as requested by the EPA and the State of Kansas, related to the design effort.

4. Attend project site visits and meetings with the EPA, the State of Kansas and/or the public and participate in telephone conference calls related to the project.

5. Manage contracts for the pre-design and design work including procurement activities for any subsequent modifications and revisions to the original scope. Local contractors from communities in proximity to the Cherokee County Site shall be utilized to the extent practicable.

6. Provide 30 days notice to the EPA and the State of Kansas regarding any planned field trips and provide opportunities for the collection of split or duplicate environmental samples by the EPA and the State of Kansas.

7. Provide monthly progress reports to the EPA and the State of Kansas containing the following information:

Site name;

Summary of the work performed during the reporting period;

Projected work for the next reporting period;

Estimate of the percentage of the project completed and a schedule update;

Summaries of all contacts with the local community, public and private organizations, and federal/state officials during the reporting period; and

Summaries of significant problems encountered during the reporting period or projected in future periods.

RECORD RETENTION REQUIREMENTS

Project documents shall be retained for a minimum of thirty years, after which written permission from the EPA is necessary prior to disposal.

PROJECT SPECIFIC CONDITIONS

1. The EPA and the State of Kansas will be offered an opportunity to participate in contractor meetings and field visits in which the project scope and/or problem issues are discussed.

2. A single project manager shall represent all of the Settling Defendants and will regularly brief the EPA Remedial Project Manager (RPM) on the current status of the project. Briefings will be monthly, at a minimum, unless a different frequency is mutually agreed upon by both project managers. Emphasis shall be placed on project scope, implementation, and schedule.

3. All site personnel and contractors will have the appropriate safety training and be involved in a medical monitoring program as specified in 29 Code of Federal Regulations Part 1910: 51 CFR 45663 - 45675; and Section 125(e) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended.

4. The EPA will provide indemnification of federal workers or federal contractors that may be involved in the project for extraordinary risk, to the extent that CERCLA funds are available in accordance with Section 119 of CERCLA and EPA implementing guidance.

5. The EPA will have final authority for approving all project specific plans and reports.

6. The EPA RPM is the point of contact for the project and is designated as Mr. Dave Drake. The contact for the State of Kansas is Mr. Leo Henning. Contact information is provided below:

Mr. Dave Drake
U.S. Environmental Protection Agency
901 North 5th Street
Kansas City, KS 66101
Phone: (913) 551-7626
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Mr. Leo Henning
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1000 SW Jackson, Suite 410
Topeka, KS 66612-1367
Phone: (785) 296-1914
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Submission Schedule	Due Date (calendar days)
Remedial Design Work Plan	60 days from signature date of Consent Decree
Design Submittals	Pursuant to EPA approved schedule in RD Work Plan
Design Implementation (Remedial Action)	60 days from approval of the Final Design
Progress Reports	Monthly until the remedy is implemented, quarterly during O&M for years 1 and 2, semi-monthly for years 3 - 5, and annually thereafter

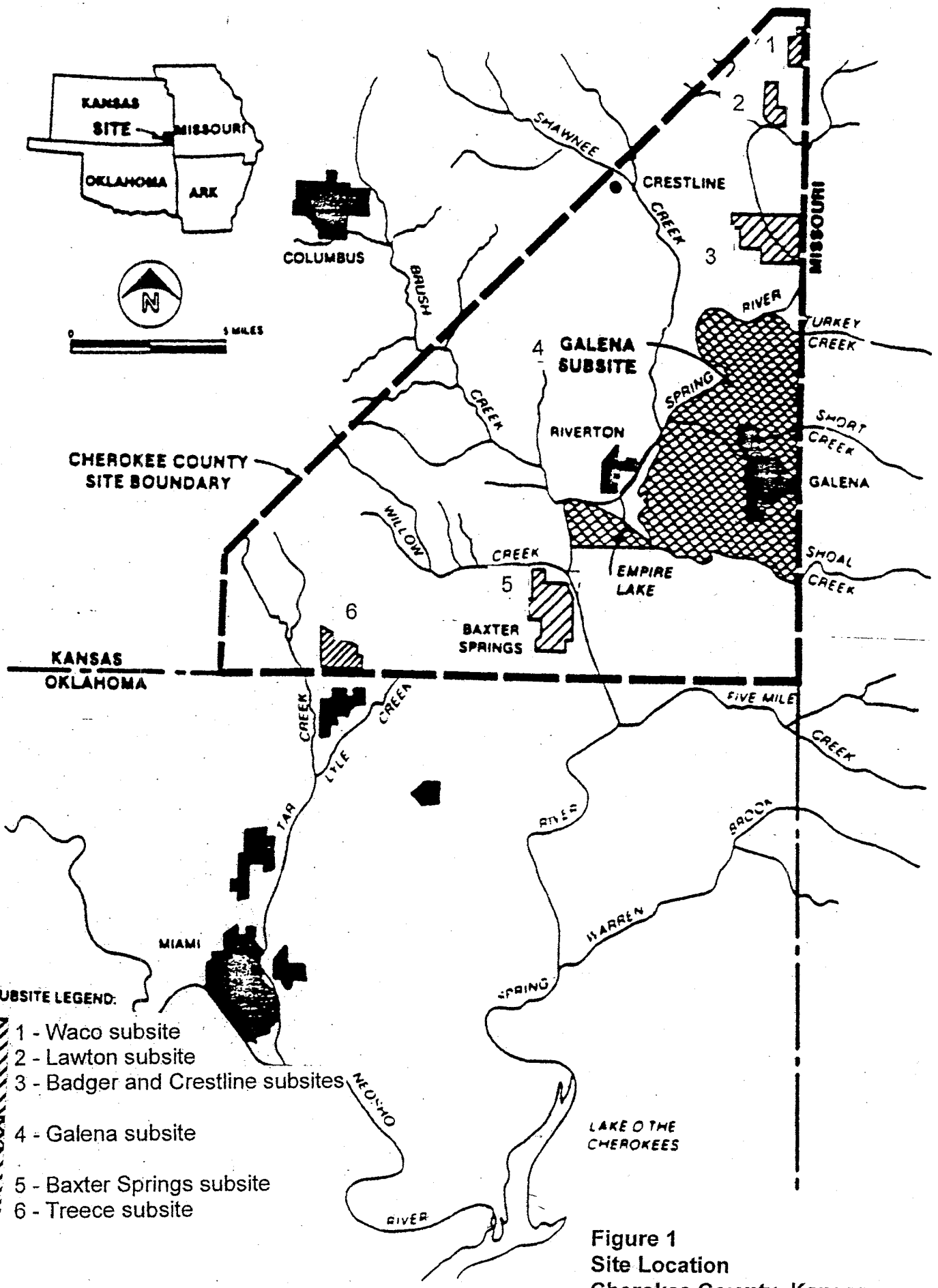

Figure 1
Site Location
Cherokee County, Kansas

APPENDIX B2

Consent Decree Appendix B2

SCOPE OF WORK FOR REMEDIAL ACTION OPERABLE UNIT #06, WACO SUBSITE CHEROKEE COUNTY, KANSAS SUPERFUND SITE EPA I.D. # KSD980741862

SITE

Cherokee County Superfund Site
Operable Unit #06, Waco Subsite
Cherokee County, Kansas

PURPOSE

The purpose of this scope of work (SOW) is to provide a framework for completion of a responsible party remedial action (RA) for non-orphan areas of the Waco subsite portion of Operable Unit #06 (OU-6) of the Cherokee County Superfund Site. The remedy will involve excavation, consolidation, subaqueous disposal, capping, and re-vegetation of surficial mining wastes, removal and disposal of metals-impacted sediments from designated ephemeral channels, and groundwater characterization. Long-term operation and maintenance (O&M) of the completed remedy is also an aspect of the cleanup and this SOW.

BACKGROUND

The Cherokee County Superfund site is located in the southeast corner of the State of Kansas and is part of the Tri-State Mining District (District). The District is an inactive lead and zinc mining area that encompasses approximately 2,500 square miles in southeast Kansas, southwest Missouri, and northeast Oklahoma. The district was one of the most productive lead and zinc mining areas in the United States and was mined from the late 1800s to 1970.

The U.S. Environmental Protection Agency (EPA) placed the Cherokee County Superfund Site on the National Priorities List in 1983. The Site encompasses approximately 115 square miles in southeastern Kansas and is divided into seven subsites designated as Galena, Baxter Springs, Treece, Badger, Lawton, Waco, and Crestline. The accompanying remedial design (RD) SOW contains a site figure.

REMEDY

Applicable portions of the Waco subsite remedy, as specified in the OU-6 Record of Decision, consist of the following elements:

* Excavate, consolidate, and/or cap all surficial mine wastes and excavate metals-impacted sediments from designated ephemeral channels. Mining wastes in heavily forested, thickly vegetated areas will not be subject to remediation.

* Utilize subaqueous mine waste disposal to the maximum extent practicable.

* Cap subsidence pits, consolidation areas, tailings impoundments, and in-place chat/tailings areas utilizing topsoil and clay caps with a minimum total thickness of 1.5 feet. The use of other materials in conjunction with soil, such as fly ash, is acceptable pending a successful assessment of viability.

* Re-contour and re-vegetate all disturbed areas and facilitate drainage and erosion controls. Construct sedimentation basins, detention ponds, dikes, berms, and swales to the extent necessary to control run-on and run-off.

* Abandon deep wells to prevent cross-contamination between the shallow and deep aquifers.

* Utilize information from the completed remedial design, and any pre-design investigations, to optimally execute the remedial action.

* Assess the sediments of any water-filled shafts, pits, ponds, or collapse features not filled during the remedial action. Provide suitable cover, such as soil or rip rap, on near shore sediments that exceed numeric or Site-specific criteria.

WORK STATEMENT

It is assumed that the responsible party areas of the Waco subsite will be remediated as a joint project; thus, the Settling Defendants involved at a given location will jointly conduct the RA, in accordance with the earlier completed RD,

utilizing a common contractor. The RA tasks consist of the following elements:

1. Prepare a RA work plan that includes the components of the completed RD. The plan must contain a schedule of all tasks associated with implementing the design. All RA submittals are subject to review and approval by the EPA with input from the State of Kansas. All submittals shall be provided to the EPA and the State of Kansas and shall consist of two copies to the EPA and one copy to the State of Kansas.

2. Implement the RA in accordance with the completed RD and RA work plan.

3. Complete any necessary modifications to the long-term O&M plan to address routine inspections, sampling, analysis, and reporting related to the ongoing maintenance of the constructed remedy.

4. Implement long-term O&M to inspect the integrity of the engineered components and to monitor the effectiveness of the remedy over time.

5. Prepare a remedial action report documenting and describing the cleanup actions performed.

6. Reproduce RA documents and supporting information requested by the EPA and the State of Kansas.

7. Attend project site visits and meetings with the EPA, the State of Kansas and or the public and participate in telephone conference calls related to the project.

8. Manage contracts for the RA including field oversight of construction activities and procurements related to modifications or changes to the design requirements. Local contractors and workers from communities in proximity to the Cherokee County site shall be utilized to the extent practicable.

9. Provide adequate notice of RA sampling activities and opportunities for the collection of split or duplicate environmental samples by the EPA and the State of Kansas during RA implementation.

10. Provide monthly progress reports to the EPA and the State of Kansas containing the following information:

Site name;

Summary of the work performed during the reporting period;

Projected work for the next reporting period;

Estimate of the percentage of the project completed and a schedule update;

Summaries of all contacts with the local community, public and private organizations, and federal/state officials during the reporting period; and

Summaries of significant problems encountered during the reporting period or projected in future periods.

RECORD RETENTION REQUIREMENTS

Project documents shall be retained for a minimum of thirty years, after which written permission from the EPA is necessary prior to disposal.

PROJECT SPECIFIC CONDITIONS

1. The EPA and the State of Kansas will be offered an opportunity to participate in contractor meetings and site visits in which the project scope and/or problem issues are discussed.

2. A single project manager shall represent all of the responsible parties and will regularly brief the EPA Remedial Project Manager (RPM) on the current status of the project. Briefings will be monthly, at a minimum, unless a different frequency is mutually agreed upon by both project managers. Emphasis shall be placed on project scope, implementation, and schedule.

3. All site personnel and contractors will have the appropriate safety training and be involved in a medical monitoring program as specified in 29 Code of Federal

Regulations Part 1910: 51 CFR 45663 - 45675; and Section 125(e) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended.

4. The EPA will provide indemnification of federal workers or federal contractors that may be involved in the project for extraordinary risk, to the extent that CERCLA funds are available in accordance with Section 119 of CERCLA and EPA implementing guidance.

5. The EPA will have final authority for approving all RA submittals.

6. The EPA RPM is the point of contact for the project and is designated as Mr. Dave Drake. The contact for the State of Kansas is Mr. Leo Henning. Contact information is provided below:

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Mr. Leo Henning
Kansas Department of Health and Environment
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Submission Schedule	Due Date (calendar days)
Remedial Action Work Plan	60 days from EPA approval of the final design
RA Implementation	60 days from EPA approval of the final RA Work Plan
Pre-final and Final RA Inspection Reports	At the completion of the Operational and Functional (O&F) Period (one year from construction completion)
Remedial Action Report	60 days from EPA approval of the Final Inspection Report and termination of O&F Period
Operation & Maintenance Plan	Submit with the Final RA Inspection Report
O&M Inspections & Reports	In accordance with the EPA approved O&M Plan
Progress Reports	Monthly until the remedy is Implemented, quarterly during O&M for years 1 and 2, semi-monthly for years 3 - 5, and annually thereafter

APPENDIX B3

Consent Decree Appendix B3

SCOPE OF WORK FOR SUNOCO Inc.

**REMEDIAL DESIGN & REMEDIAL ACTION
FOR PORTIONS OF THE WACO DESIGNATED AREA,
Jasper COUNTY, MISSOURI AND
OPERABLE UNIT #06, WACO SUBSITE,
CHEROKEE COUNTY, KANSAS SUPERFUND SITE
EPA I.D. # KSD980741862**

SITE

Cherokee County Superfund Site
Operable Unit #06, Waco Subsite
Cherokee County, Kansas
AND
Jasper County Superfund Site
Operable Unit #01, Waco Designated Area
Jasper County, Missouri

PURPOSE

The purpose of this scope of work (SOW) is to provide a framework for completion of a remedial design (RD) and a remedial action (RA) for portions of the Waco subsite of Operable Unit #06 (OU-6) of the Cherokee County Superfund site and the Waco Designated Area of the Jasper County Superfund site. This SOW is predominantly based on Sunoco Inc. (Sunoco's) Good Faith Offer (GFO), dated January 2005, submitted to the U.S. Environmental Protection Agency (EPA). Sunoco is involved in the area due to ownership of the Barnsdall Zinc Company which mined and milled lead and zinc at the Barnsdall No. 2 in Missouri (within the Waco Designated Area) and the Waco No. 1 and Barnsdall No. 3 in Kansas (within the Waco Subsite). Please see Figures 1 and 2. This SOW does not address Sunoco actions associated with other parties at the Grasselli and SW-W4 channel areas of OU-6. These actions are included in Appendices B1 and B2 of the Consent Decree.

The mine and mill waste remedy will involve excavation, capping, subaqueous disposal, re-vegetation of the cap on surficial mining wastes, and groundwater characterization. Design investigations may be performed to more accurately

determine pre-remedial conditions for the design effort. Long-term operation and maintenance (O&M) of the completed remedy is also an aspect of the cleanup and this SOW.

BACKGROUND

The Cherokee County Superfund site is located in the southeast corner of the State of Kansas. The Jasper County Superfund site lies east and adjacent to Cherokee County in the southwestern part of Missouri. Both sites are part of the Tri-State Mining District. The Tri-State Mining District is an inactive lead and zinc mining area that encompasses approximately 2,500 square miles in southeast Kansas, southwest Missouri, and northeast Oklahoma. The district was one of the most productive lead and zinc mining areas in the United States and was mined from the late 1800s to the early 1970s.

The EPA placed the Cherokee County Superfund Site on the National Priorities List (NPL) in 1983. The Cherokee County site encompasses approximately 115 square miles and is divided into seven subsites, including OU-6 which is Badger, Lawton, Waco, and Crestline, and is located in the northern portion of the site. The Jasper County Superfund site, which includes parts of Newton County, was added to the NPL in 1990 and encompasses approximately 270 square miles. The Jasper County site is subdivided into four subsites based on affected media and source, including OU-1, which is mill and mine waste. As indicated earlier, Sunoco's area of responsibility lies within the Waco subsite of the Cherokee County site and the adjacent Waco Designated Area of the Jasper County site. This separation is based solely on state boundaries. Since the basic environmental conditions are the same in both locations, Sunoco proposed a single remediation and restoration approach for both locations. This proposal is the predominant basis of this SOW. The RD and RA will be conducted as part of the work specified in the Cherokee County, Kansas Superfund site OU-6 Record of Decision (ROD), released in September, 2004.

REMEDY

The remedy proposed by Sunoco, as outlined in the GFO and acceptable within the framework of the OU-6 ROD, consists of the following elements for Barnsdall No. 2 (Missouri) and No. 3 (Kansas) mining areas (see Figures 1 and 2):

* Remaining mill wastes (approximately six acres) in the southern wooded areas of the Missouri portion (see Areas 1 and 2 on Figure 2) will be excavated to clean soil. The waste will be disposed in subsidence pits located in the state of Missouri.

* Approximately 30 acres of chat and tailings at the Barnsdall No. 3 parcel will be covered with a clay/soil cap. The cap will be designed to limit infiltration, increase evapo-transpiration, resist erosion, and promote runoff. The cap, consisting of clayey subsoil and clayey topsoil, will be placed on the following mine waste areas: North Tailings, Chat Borrow, and Southwest Area shown on Figure 2. The remaining approximately 10 acres of mill waste will be excavated to clean soil and disposed of subaqueously in the East Pond, a subsidence pit.

* All capped mill waste, filled subsidence pits, and excavated areas will be seeded with native warm-season grasses and forbs to help establish wildlife habitat. At the Waco subsite, Sunoco will also negotiate with the landowner for a 20-year, 40-acre conservation easement that would allow establishment of mature wildlife habitat.

* Monitoring wells will be installed at select filled subsidence pits for groundwater sampling.

* The west and north perimeters of the Barnsdall No. 3 in the Waco subsite will be bermed. Per the landowner's request, fencing and a gate will also be installed.

* Post-remedy drainage will mimic existing drainage. Runoff will be retained on-site via historical channels and the cutting of several new features to various ponds. Specifically, channels will be cut to drain the Southwest Area to the Central Pond. Channels will be cut to drain the North Tailings area to the No. 5 pond. A permanent culvert will be installed under the road at station nine to drain standing water along the west side of the haul road to Shaft No. 3 pond. A drainage swale will be excavated along the north property line to allow drainage to the east.

* The chat banks along Central Pond and Shaft No. 3 pond will be excavated to clean soil. The banks will be rip-rapped as necessary.

* A sediment retention basin will be constructed at the eastern edge of North Tailings along with a rip-rapped spillway to the No. 5 pond. Several other subsidence pits will be maintained as retention basins and used as fishing ponds. Central Pond will be deepened to a minimum of four feet in order to function as a retention basin. One pit may be filled with construction debris.

* Two areas will be graded: the southwest area to slope towards Central Pond and the south perimeter to slope east and towards Shaft No. 3 pond.

* Where needed, brush and small tress will be cleared and grubbed. Large cottonwoods will be retained.

* In Kansas, mine-related shallow aquifer wells, deep aquifer wells, and cased mine vents will be abandoned per Kansas State water well regulations.

The remedy and restoration for Waco No. 1 (see Figure 1) consists of the following elements:

* All surficial mine wastes will be excavated on a visual basis to the original soils underneath and disposed of in either small collapse pits or the larger Grasselli D subsidence pit. Mining wastes in heavily forested, thickly vegetated areas will not be subject to remediation.

* Ponds/subsidence pits will be capped with clayey subsoil and clayey topsoil, and seeded with native warm-season grasses. Excavated areas would be seeded according to the landowner's wishes.

This SOW contains three modifications to the proposed remedy as documented in the GFO in order to conform to the OU-6 ROD:

* The capping criteria for mine wastes and backfilled pits will be 18 inches of clayey subsoil/topsoil in accordance with the OU-6 ROD; the GFO proposed 12 inches.

* All of the excavated wastes will be disposed of in their state of origin; the GFO indicated that some Missouri waste would be placed in Kansas.

* Specific areas proposed for capping or excavation, and other pre-remedial specifics detailed in the GFO, may be modified based on updated remedial design, or pre-design, data as necessary. The OU-6 ROD goal is to address all surficial wastes by capping or subaqueous disposal and there is flexibility in using each approach. Disposal is preferred when viable because the wastes are consolidated thus making more land available for beneficial reuse and reducing the long-term O&M requirements associated with cap maintenance in perpetuity.

WORK STATEMENT

The RD tasks consist of the following elements:

1. Review existing historical information, as necessary, and prepare a design work plan outlining the recommended approach to conduct the design effort. Prepare pre-design (characterization plans and reports) and design submittals (30%, 60%, 90%, 95%, 100%, etc.) as specified in the approved RD work plan. All submittals are subject to review and approval by the EPA with input by the States of Kansas and Missouri.

2. Prepare design packages to implement the remedy, which is summarized in the GFO and this SOW. The package will consist of engineering plans and specifications, and include the following: the pre-design and design document sequence specified in the final approved RD work plan; a design analysis report; a chemical data acquisition plan; an O&M plan for post remedy implementation; a quality assurance project plan; a site safety plan; cost and schedule estimates; a community relations plan; an organizational chart; and progress reports.

3. Manage contracts for the pre-design and design work including procurement activities for any subsequent modifications and revisions to the original scope. Local contractors from communities in proximity to the Cherokee County and Jasper County sites shall be utilized to the extent practicable.

4. Provide 30 days notice to the EPA and the States of Kansas and Missouri regarding any planned field trips to the site and provide opportunities for the collection of split or duplicate environmental samples by the EPA and the States of Kansas and Missouri.

The RA tasks consist of the following elements:

1. Prepare a RA work plan that includes the components of the completed RD. The plan must contain a schedule of all tasks associated with implementing the design. All RA submittals are subject to review and approval by the EPA with input from the States of Kansas and Missouri.

2. Implement the RA in accordance with the completed RD and RA work plan.

3. Prepare a long-term O&M plan to address routine inspections, sampling, analysis, and reporting related to the ongoing maintenance of the constructed remedy.

4. Implement O&M to address the long-term requirements of inspecting and monitoring the engineered actions over time.

5. Prepare a remedial action report documenting and describing the cleanup actions performed.

6. Manage contracts for the RA including field oversight of construction activities and procurements related to modifications or changes to the design requirements. Local contractors and workers from communities in proximity to the Cherokee County and Jasper County sites shall be utilized to the extent feasible.

7. Provide adequate notice of RA sampling activities and opportunities for the collection of split or duplicate environmental samples by the EPA and the States of Kansas and Missouri during RA implementation.

For both the RD and RA phases:

1. All submittals for both the RD and RA phases shall be provided to the EPA and the States of Kansas and Missouri. The submittals shall consist of two copies to the EPA and one copy to the appropriate state.

2. Monthly progress reports will be provided to the EPA and the appropriate state (either Kansas or Missouri), and shall contain the following information:

Site name;

Summary of the work performed during the reporting period;

Projected work for the next reporting period;

Estimate of the percentage of the project completed and a schedule update;

Summaries of all contacts with the local community, public and private organizations, and federal/state officials during the reporting period; and

Summaries of significant problems encountered during the reporting period or projected in future periods.

3. Reproduce design documents and other reports and documentation related to the RD and RA, such as analytical data and drawings, as requested by the EPA and the States of Kansas and Missouri. Attend project site visits and meetings with the EPA and the States of Kansas and Missouri. Attend scoping meetings and participate in telephone conference calls related to the project.

RECORD RETENTION REQUIREMENTS

Project documents shall be retained for a minimum of thirty years, after which written permission from the EPA is necessary prior to disposal.

PROJECT SPECIFIC CONDITIONS

1. The EPA and the States of Kansas and Missouri will be offered an opportunity to participate in contractor meetings and site visits in which the project scope and/or problem issues are discussed.

2. A single project manager shall represent the project for all non-governmental parties and will regularly brief the EPA Remedial Project Manager (RPM) on the current status of the project. Briefings will be monthly, at a minimum, unless a different frequency is mutually agreed upon by both project

managers. Emphasis shall be placed on project scope, implementation, and schedule.

3. All site personnel and contractors will have the appropriate safety training and be involved in a medical monitoring program as specified in 29 Code of Federal Regulations Part 1910: 51 CFR 45663 - 45675; and Section 125(e) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended.

4. The EPA will provide indemnification of federal workers or federal contractors that may be involved in the project for extraordinary risk, to the extent that CERCLA funds are available in accordance with Section 119 of CERCLA and EPA implementing guidance.

5. The EPA will have final authority for approving all project specific plans and reports.

6. For the purposes of the Consent Decree, the SOWs contained therein, and monitoring and oversight of the Kansas work, contact information is provided below:

Mr. Dave Drake
U.S. Environmental Protection Agency
901 North 5th Street
Kansas City, KS 66101
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Mr. Leo Henning
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Phone: (785) 296-1914
Fax: (785) 296-1686
e-mail: lhenning@kdhe.state.ks.us

For the purposes of monitoring and overseeing the Missouri work, contact information is provided below:

Mr. Mark Doolan
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Fax: (913) 551-7063
e-mail: doolan.mark@epa.gov

Mr. John Weber
Missouri Department of Natural Resources
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Jefferson City, MO 65102
Phone: (573) 751-2852
Fax: (573) 751-7869
e-mail: john.weber@dnr.mo.gov

Submission Schedule	**Due Date (calendar days)**
Remedial Design Work Plan	60 days from signature date of Consent Decree
Design Submittals	Pursuant to EPA approved schedule in RD Work Plan
Remedial Action Work Plan	60 days from EPA approval of the final design
RA Implementation	60 days from EPA approval of the final RA Work Plan
Pre-final and Final Inspection Reports	At the completion of the Operational and Functional (O&F) Period (one year from construction completion)
Remedial Action Report	60 days from EPA approval of the Final Inspection Report and termination of O&F

Operation & Maintenance Plan	Submit with the Final RA Inspection Report
O&M Inspections & Reports	In accordance with the EPA approved O&M Plan
Progress Reports	Monthly until the remedy is implemented, quarterly during O&M for years 1 and 2, semi-monthly for years 3 - 5, and annually thereafter

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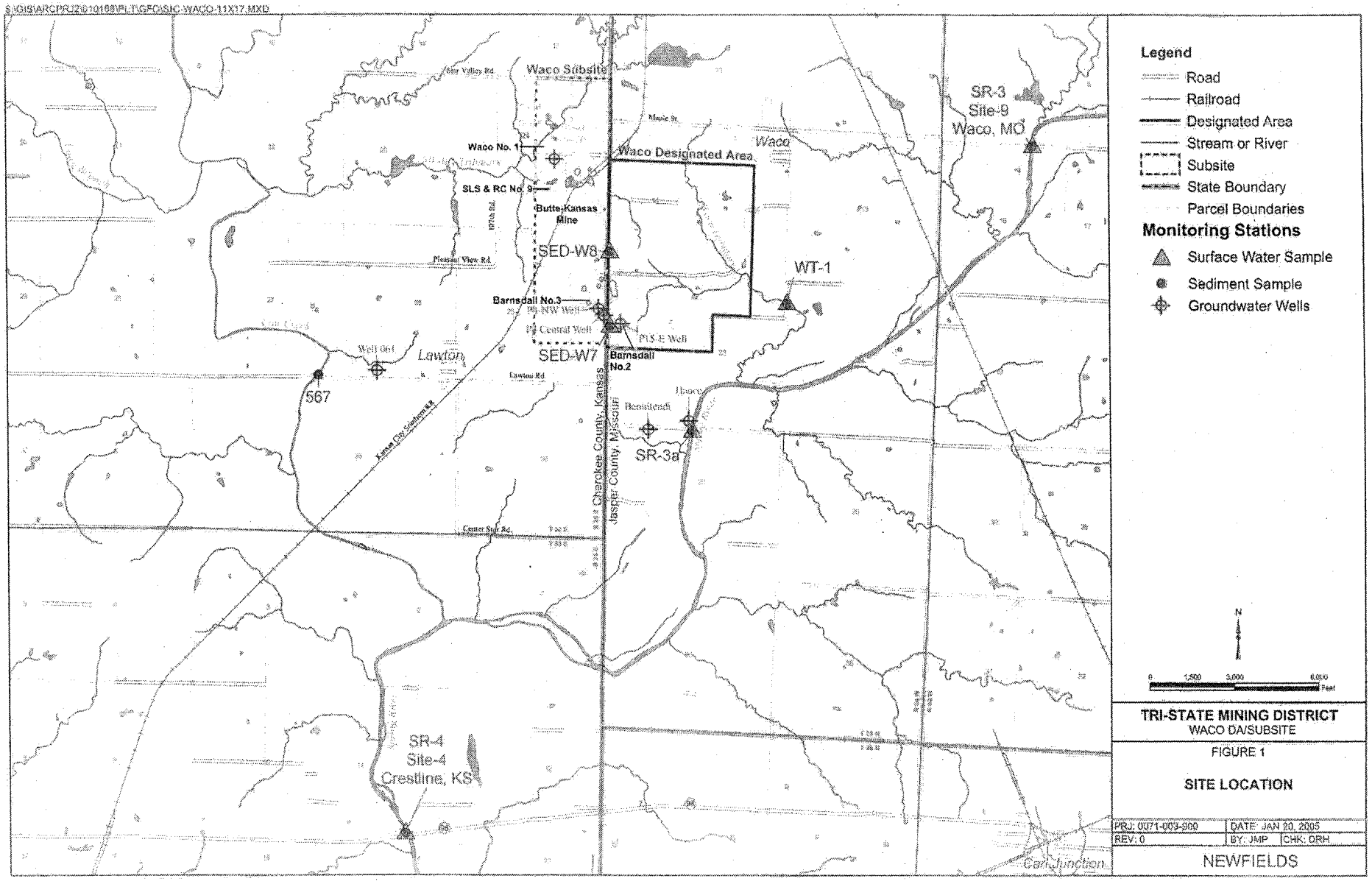


TRI-STATE MINING DISTRICT
WACO DA/SUBSITE

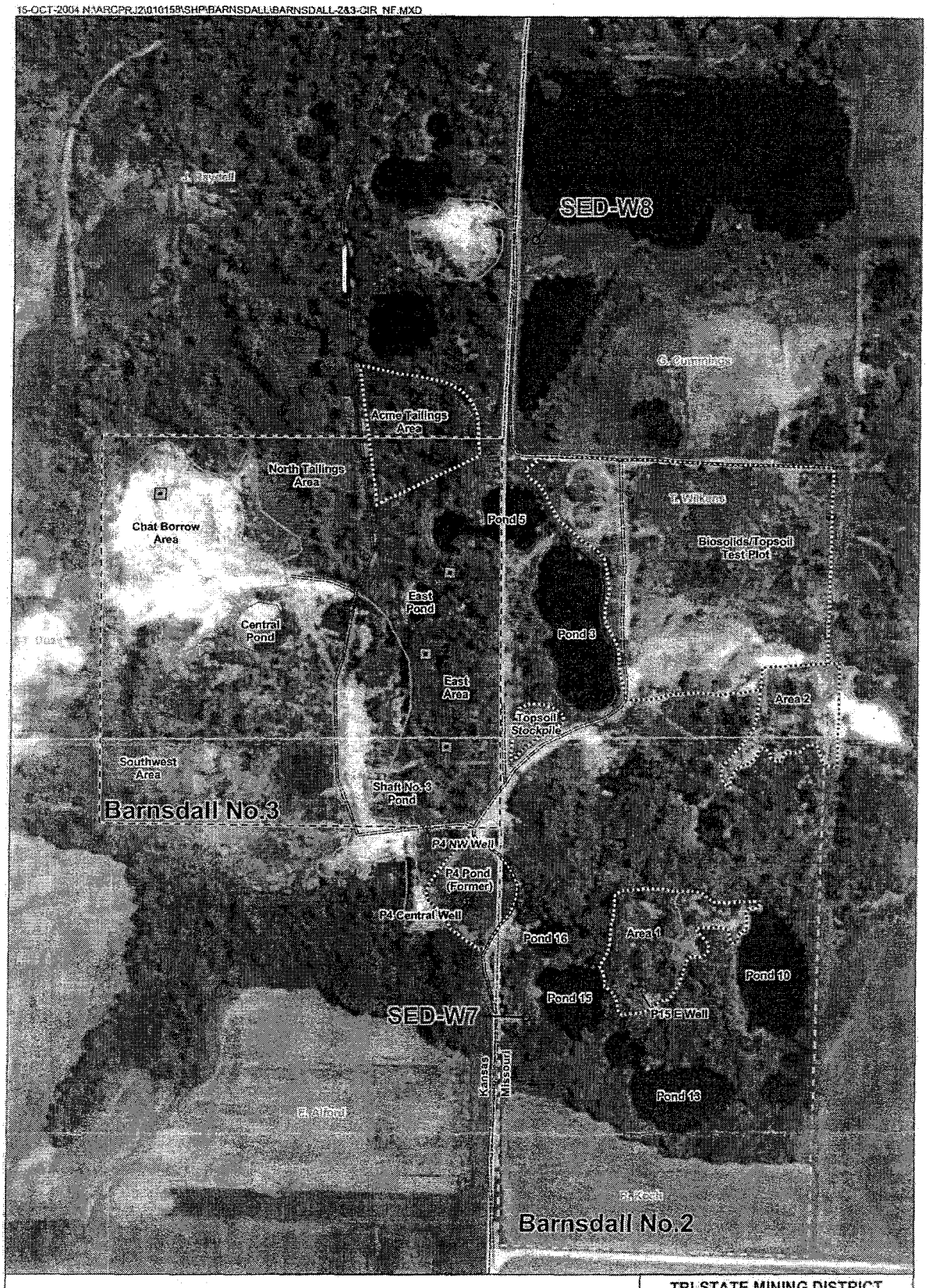
FIGURE 1

SITE LOCATION

PRJ: 0071-003-900	DATE: JAN 20, 2005
REV: 0	BY: JMP CHK: DRH

NEWFIELDS

15-OCT-2004 N:\ARCPRJ2\010158\SHP\BARNSDALL\BARNSDALL-2&3-CIR_NF.MXD



Legend

- Property
- Chat
- Roads
- Wells
- Test Pits
- Sediment Sample Location

2003 NAIP Aerial Photography

N

0 300 600

Feet

TRI-STATE MINING DISTRICT

WACO DA/SUBSITE

FIGURE 2

BARNSDALL NO. 2 & NO. 3 PARCELS

PRJ: 0071-003-900	DATE: JAN 20, 2005
REV: 0	BY: MCP CHK: DRH

NEWFIELDS

APPENDIX C1

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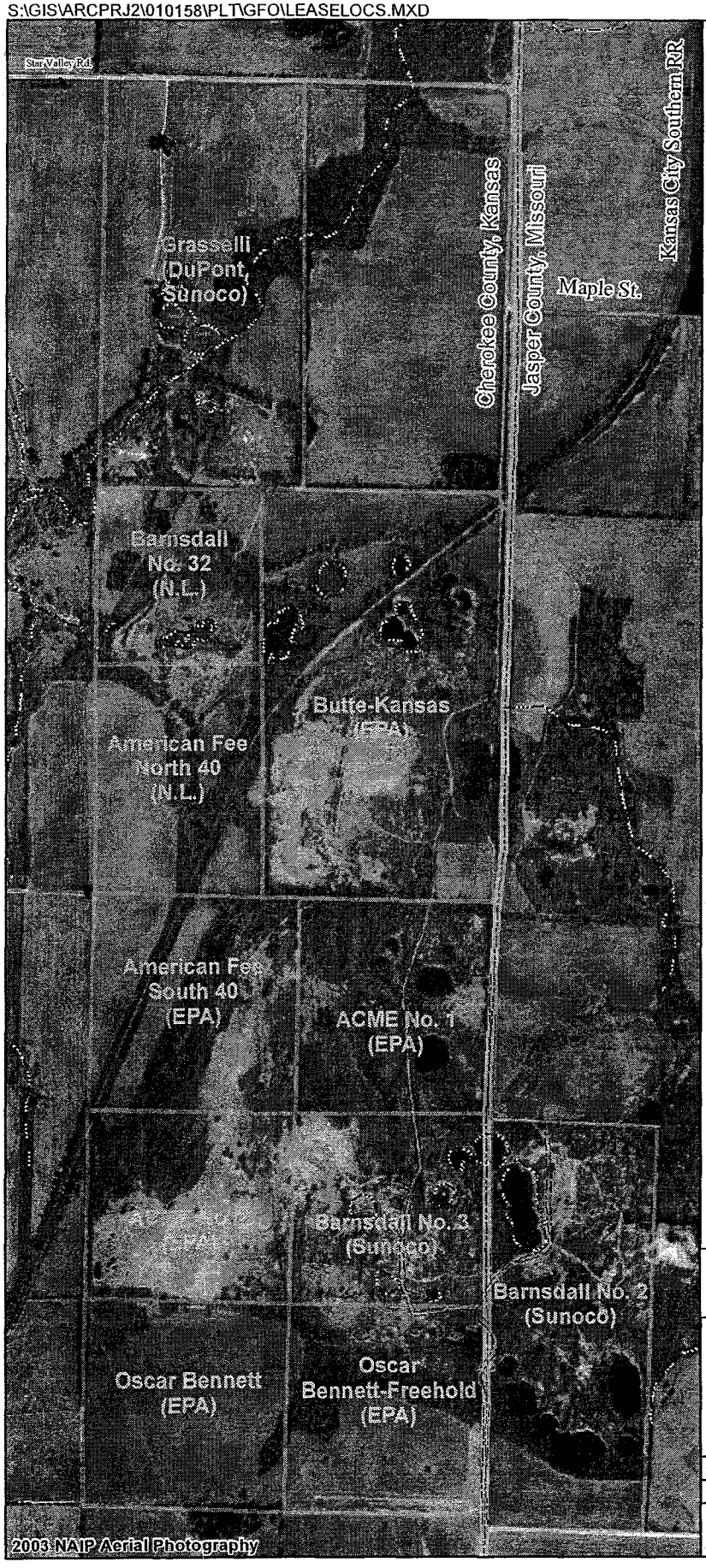

Legend

- River or Stream
- Ponds
- Lease Areas
- State Boundary

N

DRAFT

0 1,000 2,000

Feet

TRI-STATE MINING DISTRICT

WACO SUBDISTRICT, KS

LEASE AREAS

PRJ: 0071-003-900	DATE: SEP 8, 2006	
REV: 0	BY: MCP	CHK: DRH

NEWFIELDS

Appendix C1

APPENDIX C2

APPENDIX C2

AREAS OF WORK

REMEDIAL DESIGN AND REMEDIAL ACTION CONSENT DECREE
WACO KANSAS SITE
WACO MISSOURI SITE

This remedial design/remedial action (RD/RA) Consent Decree appendix describes the specific work areas to be addressed by each Settling Defendant, and also includes the work areas to be addressed by the U.S. Environmental Protection Agency (EPA). Appendix C1 is a map that depicts the work areas. Each party, or group of parties, will perform work in discrete areas as discussed below.

EPA Work Areas

The EPA will fund and be responsible for the remediation of mine wastes in the Butte-Kansas, American Fee South 40, the portion of American Fee North 40 east of the railway, ACME No. 1 and 2, Oscar Bennett, and Oscar Bennett-Freehold No. 1 areas of the Waco Kansas Site. The Settling Defendants will not be responsible for funding or implementing any of this work.

N.L. Industries, Inc. Work Areas

N.L. Industries, Inc. will fund and be responsible for the remediation of mine wastes in the Barnsdall No. 32 (St. Louis No. 9 mill) and the portion of the American Fee North 40 west of the railroad of the Waco Kansas Site. Additionally, N.L. Industries, Inc. will fund and be responsible for the removal of metals-impacted sediments from the No. 9 tributary of the SW-W4 channel of the Waco Kansas Site.

Sunoco, Inc. Work Area

Sunoco, Inc. will fund and be responsible for the remediation of mine wastes in the Barnsdall No. 3 and southern spillover locations within the Oscar Bennett-Freehold area of the Waco Kansas Site. Additionally, Sunoco, Inc. will fund and be responsible for remediation of mine wastes for the Barnsdall No. 2 area of the Waco Missouri Site.

E.I. du Pont de Nemours and Company and Sunoco, Inc. Work Areas

E.I. du Pont de Nemours and Company and Sunoco, Inc. will jointly fund and be responsible for the remediation of mine wastes in the Grasselli area of the Waco Kansas Site. Additionally, E.I. du Pont de Nemours and Company and Sunoco, Inc. will jointly fund and be responsible for removal of metals-impacted sediments from the Grasselli tributary of the SW-W4 channel of the Waco Kansas Site.

E.I. du Pont de Nemours Company, NL Industries, Inc., and Sunoco, Inc. Work Areas

E.I. du Pont de Nemours Company, NL Industries, Inc., and Sunoco, Inc. will jointly fund and be responsible for the removal of metals-impacted sediments from the SW-W4 channel of the Waco Kansas Site. The work area in the SW-W4 channel, an ephemeral tributary of Cow Creek, is designated as that part of the channel extending from 90th road upstream 1.2 miles to the confluence of the Grasselli tributary and the No. 9 tributary.

Staging of the Work

Surficial mining wastes will be addressed prior to conducting cleanup work in the receiving water bodies. The work will be coordinated and staged to alleviate any potential up-gradient impacts to down-gradient cleanup locations. For example, the work in the SW-W4 channel will be conducted during periods of no flow and after the work in all other work areas is complete.